CEREBRAL DOMINANCE

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CEREBRAL DOMINANCE

The Problem of Dominance:

Ever since Dax[1] pointed out in 1836 the association of the left cerebral hemisphere with "forgetfulness of the signs of thought" and that loss of speech depended on a lesion of that hemisphere -- his work being followed up later and expanded by Broca and Hughlings Jackson -- the problem of the role of cerebral dominance has engaged the interest and attention of neurologists and psychiatrists, psychologists and educators alike. There is a considerable amount of published work on various aspects of this subject, but owing to the essentially functional nature of the problem, most of the authors have put forward theories, without being able to give proof of them on any anatomical, pathological or organic basis. Much of the original discussion and research into the problem was done in Britain; for example, the work of Cunningham[2], Head[3], Hinshelwood[4] and Gordon, but in recent years, the work has been carried out largely in America, apart from the work of Burt and Brain.

The first description of the localisation of the speech "centre" -- or area -- or node, whichever term is preferred -- as being situated in the left cerebral hemisphere in right-handed individuals, puts the problem in more circumscribed terms than is found in actual practice. There is, in fact, a wide range of "sidedness" or preferred laterality:

the preferred use of one side refers not only to the hand, but also to the foot, and to the eye (for sighting, and also for what Blau (1946)[5] calls "eye-gaze-direction", which is from left to right in right-handed persons). There may be variations of degree in each form of laterality, whether of hand or eye -- foot laterality, or footedness is much less important in our culture, and although foot laterality may indicate any bias to right- or left-sidedness, for practical purposes, it may be largely ignored.

As well as variations in degree of each form, differences of form may be found in one individual, e.g. the person with dominant right hand and left eye. Both eyedness and handedness are affected by training, though the former is less easily affected than the latter; and the statistics of laterality given by different investigators vary according to the number and complexity of the tests used, and according to the type of activity tested, whether skilled or unskilled.

There is one basic hypothesis present in all the literature on left-handedness in the last thirty years, namely that there is some significant association between left-handedness and the language disorders -- including in the latter term the disorders of spoken, and written (visual and visual-manual) language. There is agreement that <u>some</u> association exists, but the nature of the association gives rise to wide divergences of opinion, coloured by the interests--

and prejudices- of the different authors. There are different opinions about the relative importance of the dominant hemisphere, the dominant hand, the dominant eye; about whether this dominance is inherited or acquired; about the advantages and disadvantages of training a sinistral to dextrality, and so on -- so that a balanced view is not easy to attain.

It is proposed, therefore, to discuss briefly the problem of dominance as observed by various authors, and to submit a series of cases demonstrating some of the problems in detail. The thesis will conclude with suggestions for handling the problems of dominance (and handedness) in general, and the various disabilities in particular.

Evolution of Handedness in Man:

The main difference between man and the anthropoid apes, the most highly developed of the lower animals, is in the acquisition of manual dexterity or skill, and of symbolic language. When man assumed the upright posture, the hands were no longer used for locomotion and became free for wider use - opposition of the thumb developed and manual dexterity of a high degree followed.

Certain animals show the beginnings of a choice of limb for certain practised activities: this has been shown by Tsai and Maurer (1930)[6] in their experiments with rats. Higher up the scale of

evolution, the anthropoid apes show a definite preference for the use of one hand, although right or left appear to be chosen in equal proportions, evidently by chance (Finch 1941[7], Yerkes 1943[8], in their observations on chimpanzees). The apes have no language, as we understand it, but show emotion by gesture and vocalisation.

In the development and maturation of the infant, this phylogenetic development is recapitulated. Bilateral movements of the hands — still used for locomotion in the first year -- are succeeded by more skilled movements and signs of a preferred choice of hand. Similarly the infant begins by displaying emotion in gesture and vocalisation; usually it is not until he is over a year old that he can use words with meaning, or symbolic language.

The Development of Cerebral Dominance:

The first acquisition of manual skill, and of speech usually begin at about the same time, around the end of the first year, and the opinion of most investigators appears to be that handedness precedes the development of speech, and that the hemisphere which governs the preferred hand is thereafter chosen for the speech area -- the area of the cortex of one hemisphere concerned with the various language "associations".

Brain (1945)[9], however, suggests that the localisation or siting of the speech centre comes first, and that the choice of hand follows. He

He points out that speech requires a very high degree of integration and synchronisation, and that to obtain this, some form of control higher than the bilateral hemisphere control is necessary, and that, therefore, speech necessitates Broca's area.

At this point, it is perhaps advisable to emphasize that the term "centre" is used here solely for convenience. Modern neurological opinion no longer accepts the concept of circumscribed "centres of localisation", but states simply that this area is associated with speech and when it is damaged by injury or disease, speech is affected, altered or destroyed. In a similar way, Orton (1937)[10] uses the term "engram" but is careful to explain that he does not mean a physical recording, but is using it as a term of convenience to describe some method of storing memories or association. In spite of Orton's careful reservation, Blau (1946)[5] criticises him for "going back to the exploded theory of engrams or records on the brain".

Associated with the development of language and manual skill, specialisation in cerebral control begins. Up to this time, each cerebral hemisphere has played an equal part in control, but with the greater development of manual skill and symbolic speech, an asymmetrical or unilateral control at a still higher level is necessitated. As symbolic language develops out of the emotional vocalisation of infants and the lower animals, a higher control

becomes imperative - a higher inhibitory control of the lower bilateral centres governing vocalisation, which is mainly emotional. These simpler emotional vocalisations can use bilateral pathways, but the delicate highly integrated movements of speech, with finely balanced control of all the muscles of articulation, etc. require control at a much higher level, and as the two sides must act in accurate synchronisation, this higher control is essentially unilateral.

The Dominant Hand:

This unilaterality, as shown by the use of one preferred hand is definitely established, according to archaeologists, in the Bronze Age. In the early Stone Age, there is little evidence to suggest any constant proportion of right-handedness to left-handedness. In the Neolithic Age however, a high proportion of the implements appear to have been made for one-sided use, but the distribution between right and left is in the proportion of 4 to 3. Many Archaeologists deny that it is possible to tell from the study of these primitive implements, whether they were for right- or left-sided use, but Sarasin (quoted by Blau) who made a wide study of implements of the late Stone Age and the Bronze Age, gave the above figures

In the Bronze Age, when implements had become more complex and valuable, the amount of "sidedness"

is more marked, and a definite preference for right-sidedness is shown -- Sarasin[11] states that he found 75% for right sided use and 25% for the left. Wile (1934)[12] points out that similar proportions are found to this day amongst primitive peoples like the Hottentots and Bushmen of South Africa, and the Australian Aborigines. At an early stage of man's development, therefore, a preferred laterality of hand developed. This preference was probably divided more or less equally between right and left, at first, but the bias became more and more to the right so that now, between 90 and 95% of the adult population is right-handed.

Dominance of one or other cerebral hemisphere seems then to be necessary for complete integration of the highly specialised functions of language and manual skill. The dominant hemisphere is dominant not only for speech, but also for symbolic thinking, for writing, and for purposeful manipulations such as those that are upset in Apraxia. The question of which is fixed first, the hand dominance, or the localisation of speech, is still a matter for conjecture. Brain (1945)[9] suggests that the speech area is located first. He points out that a certain hand preference and skill may be present in apes, but that there is no general right-sided preference. It is only in man that a general right-sided preference has begun, and only man has developed symbolic language. We know from our studies of

acquired aphasia that the control of symbolic language is essentially one-sided, and Brain considers it logical to conclude that this one-sided higher control then affected the choice of hand. He believes that dominance of the left cerebral hemisphere is in the nature of a dominant Mendelian character, which however, can be easily modified by later training.

Blau (1946)[5], on the other hand, is convinced that the left cerebral hemisphere is the leading one because the right hand is preferred and skill developed. He considers this to be due to cultural training -- that it is acquired and not hereditary -- and traces this cultural training from the Bronze Age, when more or less adequately constructed tools, handed on from one generation to the next, enforced the use of one preferential side.

In his monograph "The Master Hand" Blau discusses fully the aetiology of right- and left-handedness, but stresses that the development of a master hand is an acquired characteristic, and that it is a purely cultural trait. He tends to deride the "hereditarians" who say handedness is hereditary, but does not satisfactorily explain the frequent occurrence of left handedness in the family histories of left-handed individuals.

Blau asserts that as handedness is an acquired trait, it should be assessed by the testing of learned and skilled activities. In spite of this

assertion, however, he discounts the figures given by Chamberlain (1928)[13] that 2% of children were left-handed, when both parents were right-handed; when one or both parents were left-handed, 17.3% of the children were left handed, and in 33 families where both parents were left handed, 46% of the children were left handed. Blau criticised these results on the ground that Chamberlain based his figures on the hand used for writing as the criterion of handedness -- surely a skilled and learned activity!

Probably the most accurate view is that right handedness is inherited -- as a Mendelian dominant trait, in the main -- but the trait requires to be fixed by training and practice; and that a tendency to left handedness is in the nature of a Mendelian recessive character, which, though not completely sex-linked, has some strong sex association. Brain subscribes to this view, which is also held by Burt (1937)[14] and by Orton.

The age at which the choice of hand begins has not been agreed upon by many observers. Watson (1919)[15] states that there is seldom any sign of preference before 1 year. Blau suggests that it is at some time between 9 months and 2 years that the choice is made. Eustis (1949)[16], however, states that preference shows frequent shifts in early life (up to early school age) and that the child's choice is essentially fluid and easily changed up to this time. This fluidity may be due simply to the

incomplete fixation (through lack of practice) of the inherited trait.

Gesell (1947)[17] in his studies of handedness, however, has noted that a child may show preference in reaching, shortly after 16 weeks. This is preference only; it is not dominance, which requires long training by habit and use for fixation. Gesell has also noted in his observations of the tonic neck reflex (in which the infant turns the head to the side, and the limbs straighten on that side and flex on the opposite side), the majority of infants turn to the right.

This reflex fades by about 20 weeks after birth, but Gesell has followed up for ten years 10 infants who showed a tonic neck reflex to the right, and found that they all became right handed. He also followed up 9 infants who had a tonic neck reflex to the left, and found that 4 became left-handed and 5 became right-handed. He believes that these 5 were weakly left handed also and were changed to right-handedness by training, and environmental pressure. These numbers are, of course, very small, but the results are suggestive of a definite inborn tendency to right or left sidedness which may be weak or strong, and therefore more or less affected by later training.

The Dominant Eye:

The question of a dominant or master eye has not received such wide attention as the dominant hand.

The dominance of one or other eye was for a long time associated with visual acuity, but it has now been demonstrated in many surveys that it is by no means always the eye with the better vision that becomes the master eye (Gahagan 1933).[18] As in the investigation of the preferred hand, the results vary with the type and number of tests used.

Parson (1924)[19] held the view that ocular dominance decided hand dominance, and that most people are right-handed because they are right-eyed. It is unlikely that this view is correct, as the number of right-handed individuals in the population exceeds considerably the number of right-eyed persons -- although this difference might conceivably be due to the training received by the hand.

Eye dominance is mainly a sighting problem bringing the macula, a near object, and a distant one into line. This is essentially uniocular in nature -- the use of both eyes would inevitably mean the doubling of either the near or the distant object. Vision is not developed on a purely unilateral basis in each eye; one cerebral hemisphere does not completely control one eye, but by the complex intermingling of the afferent fibres of the optic nerve, parts of both retinae are represented in each hemisphere.

It is believed that the macula of each eye (used for close and accurate vision) is represented mainly, and probably <u>only</u>, in the occipital area of the cerebral hemisphere of one, the opposite side,

while the fibres for peripheral vision, from the extra macular portions of the retinae, intermingle so that peripheral vision of each eye is represented in both hemispheres. Nevertheless most people use one eye only for many activities, and tend to prefer one eye to the other. Blau points out that the use of the eye in writing is essentially a uniocular and sighting function, as macula, fingers holding the pen, and the marks on the paper must be brought into line.

Buxton and Crosland (1937)[20] have noted that the single all-or-none tests so often used to indicate the dominant eye, do not give consistent or accurate results. They have worked out a series of four tests, each of which is repeated several times, and in which the influence of the hand is controlled by using both where possible, and alternate hands in the remaining tests. They conclude that eye preference is best defined in terms of the number of activities for which the one eye is preferred. They consider that each test should be repeated several times, and prefer to use ten repetitions.

The proportion of right-eyedness to left-eyedness is not so high as in handedness: the proportion is roughly 70-75 % right-eyed to 30-25% left-eyed. These proportions may possibly reflect the initial, inborn proportions in the population, and the fact that the hand preference can be so often influenced by training.

During the late war, Anderson and Weigall (1944)[21] did a considerable amount of work on the problems of crossed dominance that they encountered in their work in the flying training schools in Australia. Although they were both ophthalmologists primarily, and concerned mainly with problems of vision, they soon found that there were frequently difficulties in the flying training of those who had perfect vision, but crossed dominance; the master hand on one side and the master eye on the other.

They observed that flying trainees with crossed dominance took longer to train, as a rule, and had more trouble during their flying courses. In addition such subjects appeared less able to stand up to any added strain: for example, if a trainee had family worries, or was older than the other trainees, the presence of crossed dominance as well, would be enough to tip the balance and prevent successful completion of the flying training. The influence of crossed dominance, they found, went beyond the mere faulty co-operation of hand and eye, and produced confusions, lack of confidence, and finally a strong inferiority complex.

One interesting case was quoted by these authors, of an airman who was right-handed and left-eyed, and who failed in his training; he was given orthoptic treatment, his left eye was occluded for a time, and eventually the right eye became the master eye. The results of this retraining were excellent, and the man managed to complete his

training with success.

The observations of Anderson and Weigall on the difficulties arising from crossed dominance in flying schools has been confirmed by others, some of whom found that a high proportion of those who failed in initial flying schools had this disability.

Hemisphere Dominance:

With both hand and eye, all authorities agree that there are degrees of dominance varying from complete right dominance to complete left dominance, with many grades and mixtures in between. Most investigators agree that there is more trouble, confusion, and disability in those cases who show (a) mixed dominance of hand and eye or (b) incompletely established dominance of one side, especially if this incomplete dominance affects handedness.

Complete dominance of the left cerebral hemisphere with resultant right handedness and right-eyedness -- is usually assumed to indicate a more perfect integration of the nervous system. Complete dominance of the right hemisphere, with strong left-handedness and left eyedness also implies good integration, although the very strong cultural and environmental pressures in the direction of right-handedness do cause difficulties which may produce secondary emotional disturbances.

It is the mixed forms of dominance which are liable to have trouble - with speech and the learning

of written language, and even in the acquisition of a high level of manual skill. The reason why this mixed or incomplete dominance should appear to give rise to difficulties such as those mentioned above, has given rise to many theories and different attempts at explanation.

Eames (1934)[22] has suggested a purely anatomical, or neurological explanation. He points out that the association or reflex paths are lengthened when the dominant hand and dominant eye are on opposite sides, and that these lengthened paths are consequently more liable to interference. There may also be adventitious impulses of an inhibitory nature coming from the eye -- or hand -- association areas which are non-dominant. He suggests, for instance, that in left-eyed, right-handed individuals there may be functional development of a visual memory area on the right side of the brain, with trouble arising when there is simultaneous stimulation of this centre and the corresponding anatomical area on the opposite side of the brain (the side controlling the dominant hand).

Eustis (1947)[23], however, believes that the development of dominance is a consequence of neuromuscular maturation, which he considers to be closely connected with myelination of the relative association tracts and areas. He is of the opinion that all the related anomalies of language and of handedness, can be explained by delay in neuromuscular maturation, which, in turn, depends on slow

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myelination.

Before proceeding to a report of the theories put forward by Orton, Blau and others, certain additional points about cerebral dominance should be noted. Work on cerebral dominance since 1940 has indicated that dominance can no longer be considered a function of the left cerebral hemisphere alone, in right-handed individuals. The left hemisphere is dominant for certain functions only -- for accurate manipulative skill, and for speech and all forms of the language function in the right-handed. The right cerebral hemisphere, in the right-handed, appears to be dominant — that is to say, to have unilateral control over certain bilateral functions - for visual orientation in space, possibly some forms of topographical memory, awareness of the body (Brain 1941)[24] and for discrimination of time intervals (Fleischhacker 1947)[25] The latter also indicates that in a survey[26] of case reports on cerebral tumours published by many authors there is a definite impression that confusional states, hallucinations, especially visual ones, and the more psychotic symptons occur in lesions affecting the right hemisphere.

In general, one can fairly say that the more work that is done on this subject, the less clear cut and definite are the results, and the more complex the problem appears.

In the following sections a detailed description

will be given of the more important studies on this subject.

The work of S.T.Orton:

In any discussion of the problem of the language disorders, and their association with problems of cerebral dominance, the work of S.T.Orton requires study. His interest was aroused in the nineteen-twenties,[27] and the results of his observations and research were published as a monograph in 1937 -- "Reading, Writing and Speech Problems in Children". Since then, his theories have been frequently contradicted, or criticised for over-simplifying the problem; nevertheless his clinical observations and descriptions are of the greatest value, and his training methods have proved very successful.

Orton states that most individuals have a hereditary tendency to develop a predominant use of either the right or the left hemisphere. He confirms this by genetic studies of the occurrence of handedness in families, and by the persistent appearance of left-handedness in all races, in spite of the strong environmental pressures towards right-handedness. He considers that dominance of the left cerebral hemisphere is an inherited Mendelian dominant trait, and that right hemisphere dominance is therefore a recessive character. These traits are however inherited in varying strengths, and as there will not as a rule be mating of pure stocks, mixtures or "intergrades" will occur, and Orton refers to these mixtures of right and left-sidedness

as "motor intergrades".

All the pressures of modern culture are exerted towards right-handedness -- the very word "left" has unpleasant, even evil, associations in English, and in other languages; sinister, in both its ordinary and heraldic meaning; gauche in French; the fact that in morality plays, and their modern descendant, pantomime, the evil spirit enters from the left, and the good spirit from the right. These pressures will readily act on those hereditary tendencies that are less strong, so that a considerable proportion may shift from sinistrality to dextrality.

In studying his cases, Orton used a battery of tests, for eye and for hand, and in the case of the latter, he considered a history was also most important. In his studies of children with developmental defects in language, he found a great many whose motor patterns were mixed, or who had shown frequent shifts of choice from side to side.

In view of the great variability of the hereditary factors, and the resulting intergrades, Orton stresses the fact that each child must be considered as an individual and treatment arranged accordingly, on an individual basis, and that no dogmatic answer can be given as to whether any left-handed child should be taught to write with the right hand.

Orton then discusses the various syndromes: developmental alexia (sensory); developmental agraphia (motor); developmental word deafness

(sensory); developmental speech delay (motor); developmental apraxia (motor); and stuttering (motor). He points out that each of these can vary in degree, and that usually the disability is more less specific, the child's intelligence, and other educational attainments reaching normal. He has also found that in many cases there is a family history of left-handedness and/or associated language disorders.

He finds no constant emotional disturbance that can be classed as primary -- in contrast to Blau who is quoted later. The cases with reading and writing disabilities, or developmental apraxia often develop secondary inferiority feelings; those with word deafness tend to be overdependent, while the child with delayed speech is shy, and also over-dependent as a rule. The younger stutterers show no consistent emotional disturbance, but the older ones are apt to develop various personality disorders if left untreated.

It is in the interpretation of the cause of these disorders that there is most disagreement with Orton. He recognises one factor common to the whole group; a difficulty in reviving and repicturing (in the sensory syndromes) or in rebuilding and reproducing (in the motor syndromes), in the order of presentation, sequences of letters, of sounds, or of units of movement -- but again he emphasizes that each case must be considered individually, and separately assessed.

In vision - the paramount factor involved in reading and writing functions -- correct revival requires proper spatial orientation, and spatial sequences; in audition -- the factor involved in developmental word deafness -- it is revival in correct temporal orientation and sequence that is required. In the reading disability the main errors are reversals of letters (static reversals) and reversals of syllables or whole words (kinetic reversals). In developmental speech delay, although the child can echo all sounds, it cannot reproduce them blended into letter sequences and words. Orton did not find that reversals were common in his speech cases, although Blau mentions them; the errors were mainly irregular distortions in order of reproduction of the component sound units, often accompanied by omissions. Here also, the difficulty appears to be in the recall of sequences and adequate blending in reproduction.

Similarly, in stuttering, the child can begin, but cannot continue the blending process. In developmental apraxia the children are abnormally clumsy -- described by Galen as ambilevous -- and have great difficulty in learning new motor patterns, and in carrying out complex movements. This syndrome is closely associated with the absence of unilateral manual skill, and appears to be closely related to the unilateral language functions also. Here the disability depends on the defective revival and reproduction in proper sequence of various

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coordinated movements.

Orton's[18] explanation of the reading and writing disabilities is given in his theory that each hemisphere has a "record" or "engram" or memory association, which is the mirror image of the record in the opposite hemisphere. He points out that in the motor structures of the limbs, right and left are mirror images of each other, and that this right and left pairing in opposite directions -- which he calls antitropism will result in the use of similar muscles on the right and left producing results that are also mirrored opposites, if they act in the same way. The memory associations of these actions - kinaesthetic memories -- will in consequence be stored in each hemisphere, as mirror images, each of the other. In complete left hemisphere dominance the non-dominant record or "engram" is elided, or ignored, but where the dominance is incomplete or right-sided, the mirror "engram" may remain and cause confusion.

When discussing stutterers,* Orton divides them into two main groups, according to time of onset; those who stutter from the time they begin to speak, and those whose stutter begins between the ages of 6 and 8, when the teaching of written language is beginning. He also subdivides the stutterers into 4 sub-groups according to aetiology: (a) those who have had a shift of hand from left to right enforced

* Throughout this thesis the terms "stutter" and "stammer" are considered interchangeable.

by parents or nurse; (b) those who have been slow to select a master hand, or show marked motor intergrading; (c) those showing neither (a) nor (b) but who have a strong family history of stuttering; and (d) those without (a), (b), or (c), said to be sporadic -- but Orton notes that in these sporadic cases, a family history of left-handedness, or some of the other language disabilities, can very frequently be found. There is little further discussion of the aetiology of stuttering by Orton, but in general his theory is the one developed by his colleague and associate, Travis (1931).[29] This also is linked with incomplete cerebral dominance.

Travis emphasizes that a dominant kinetic rhythm is necessary for normal speech: that speech consists of synergic movements and alternating changes in various muscle groups, most of which muscles also perform other functions at other times (e.g. swallowing, sucking, etc). In speech, the synchronisation is complex and highly integrated and a "focal gradient of dominant activity" is necessary to achieve this. Disturbance of this dominance by injury, disease, or inadequate development, will produce "less well integrated speech control". Travis holds that the child who is neither right nor left-handed presents a serious problem -- that this shows immaturity and an undesirable lack of differentiation in the central nervous system. Development of speech is

therefore liable to be delayed or distorted when proper dominance is not developed.

Stuttering, Travis conceives as being due to a "general reduction of the cortical lead control", that is to say, to inadequate dominance of one hemisphere: the dominance is insufficient to give adequate integration of all the functions of speech. Sometimes this results in a lack of synchronisation of the impulses from each hemisphere, sometimes it is the relationships between higher and lower levels that are disturbed.

Travis however does not accept hereditary disturbances of dominance as being the whole cause of speech disorders. He notes that all these speech defects have as a rule two components -- primary, and precipitating factors, the former of which is usually inherent, and the latter is largely psychological and acquired. Orton and Travis therefore consider that in the investigation of stuttering, etc. the amount of dominance of one cerebral hemisphere is the important factor for consideration.

Gates (1935)[30], whose work, as a psychologist was concerned mainly with educational problems, that is to say, with difficulties in reading and writing, believes most of these difficulties arise from the use of the left eye as master eye, and that the difficulty is mainly mechanical. When the left eye is the dominant eye its line of vision is rapidly

blocked by the bridge of the nose, when the gaze travels from left to right, as in reading. He takes a much more circumscribed view than Orton and discusses the problems affecting reading and writing only. He is less concerned with the other functions covered by dominance, and mentions speech defects very briefly, and only in so far as they affect oral reading. His ideas are much more limited than those of the Psychiatrists.

Monroe (1932)[31] also, approaches the problem from the point of view of the educator. She agrees with Gates, that the important factor is the occurrence of left-eyedness, and for the same reason. Nevertheless this theory fails to provide an explanation for the difficulties of those children (proportionately fewer in number) who are left-handed and right-eyed.

The work of A. Blau:[5]

One of the most recent surveys of the problem of laterality and cerebral dominance is to be found in the monograph: "the Master Hand" by Blau, published in 1946. This monograph covers the problem of handedness and reviews fully most of the work that has been done on this subject.

At the beginning Blau notes that there are really two problems for consideration: (1) the question of a preferred hand, and (2) why, in the great majority of people, that preferred hand should be the right.

Blau approaches the problem from the standpoint of "dynamic totalism", and emphasizes the necessity for the examination in every case, of the personality as a whole. He believes that there are inborn bilateral potentialities only, and that either pure accident, or educational and other cultural forces decide the dominance. He insists that it is the strong cultural bias towards dextrality, with its continuing environmental pressures, that decides the production of right-handedness in the majority. He points out that the proportion of dextrality increases with age, and that it is gradually acquired over a period of years. It also represents a form of motor orientation of a right and left type -- the most difficult type of spatial orientation to acquire, and that it is usual to find confusions during its acquisition: these are shown by the young child's difficulty in recognising right and left, and by the confusions that occur in the learning of language -- first spoken, and later, written language. These confusions are normal, and are transitory, but when they persist, they form the basis for the "developmental language disorders" and treatment should be active and early.

For the minority who exhibit various sinistral traits he claims a strongly negativistic temperament. He says bluntly that there is no evidence that dextrality or sinistrality is inherited, whether as Mendelian dominant or recessive traits, whether

sex-linked or unlinked. He admits that the main weakness of this view is that it takes no account of persistent sinistrality, but concludes that sinistrality has its origin in some deviation in the learning process, which may be due to: (a) an inherent deficiency, which may be either mental or physical: (b) faulty education (lack of training, or training by a left handed parent or teacher); or (c) emotional negativism.

Blau believes that the majority of those with sinistral traits, whether of hand or eye, exhibit signs of emotional negativism, which in turn he believes to be a sympton of an infantile neurosis. This neurosis is the product, in the main,of parental attitudes - the patterns of love and discipline in the home -- and the most common of these is rejection of the infant by the mother. Blau states that the majority of sinistrals have this background, and he specifically includes individuals with no anomaly other than left-handedness. He adds, however -- rather naively -- that he has failed to get statistics to prove this, as the examinations and surveys proved too complex.

He is convinced that the psychological disturbances associated with sinistrality (and he includes here all persons showing <u>any</u> sinistral tendencies -- that is to say all cases of mixed dominance) may be primary or secondary. In his view, the secondary symptomsare the less important and are mainly

reactions to the inferiority feelings aroused by the anomaly. Secondary symptoms arising from the forcible training of a sinistral to dextrality he minimises -- he denies that retraining causes any trouble, but adds that it should be done early, before the age of 7 - 8 as enforced training after that age may give rise to difficulties, or fail altogether. He quotes results of a retraining scheme in one city; in 4 years, the retraining of 250 left-handed children was undertaken; no stutter or other difficulty resulted - but 66 resisted retraining.

The primary symptom -- with a causal role -- is, in Blau's opinion, an emotional negativism, with a type of personality closely allied to the anal-erotic and compulsive characters of Freudian psychology. It is this primary symptom that he considers to be all-important in the development of sinistrality, and he also holds that cerebral dominance follows the development of a chosen hand -- in sinistrals, the right cerebral hemisphere becomes the dominant hemisphere.

The author then proceeds to a discussion of the connection between dominance and language, and surveys the incidence of preferred laterality in the history and structure of language. He points out that early written languages had not the same left-to-right direction now common to Western languages -- that ancient Egyptian hieroglyphics

were often read in either direction(e.g. the cartouches of Cleopatra on the Rosetta Stone), and that our modern script is evolved from the Phœnician, read from right to left, through early Greek, read from right-to-left and left-to-right in alternate lines, to later classical Greek, in which the left-to-right direction became finally fixed.

The Semitic languages are still read from right to left, and it is to be hoped that some research will be done on problems of handedness and language disorders amongst those whose language is oriented in this way, as it might throw some light on our Western problems. Certain Biblical quotations[32] suggest that the incidence of left-handedness in the Jews may have been higher than amongst other races.

Blau's observations of the language disorders coincide closely with Orton's, but his theories about their cause differ radically from those of the latter. As with sinistrality, Blau denies that these disabilities are hereditary, and again relates them to personality disturbances - almost invariably of the negativistic type. He admits that there is a clear relationship between sinistrality and the language disorders, but declares this to be coincidental, or fraternal, and that they both arise from the same root or underlying cause, the negativistic personality disturbance of an

infantile neurosis.

He concludes by advising that all children should be trained to dextrality, but that this training should be done with care and sympathy, to avoid any pressure that might increase the negativistic reaction patterns

Burt (1937)[14], whose study of the various aspects of the subnormal school child is the most thorough and scholarly yet carried out in Britain, has investigated the problem of left-handedness and its association with stammer in London school children. He first of all gives one of the most satisfactory definitions of left-handedness yet encountered: a consistent tendency (whether congenital, or induced post-natally by accident or other change in hand or neuro-muscular apparatus) to undertake new dexterities with the left hand rather than with the right. He believes that these tendencies can be detected some time between the ages of 6 and 15 months. He points out that there may be mixed tendencies for different activities, whether mainly unimanual, or bimanual, but that it is most common to find a consistent tendency throughout. The importance of the repetition of tests at intervals is noted by this observer.

The figures that Burt has found amongst London school children are significant: 5.8% of the boys attending ordinary schools, rising to 13.5% of the boys at special (M.D.) schools were left-handed;

in girls, the percentages are 3.7% rising to 11.9% . He adds that in the mentally defective child, the superiority of one hand is always less marked. Figures are also given for the incidence of stammer: among all the right-handed children who were examined 3.2% stammered, or gave a history of having stammered before; while amongst the left-handed children, 11.9% stammered or gave a history of previous stammer. He also mentions that proportionately more difficulties occur in the mixed types, especially with mixed hand and eye, and that stammer was nearly twice as frequent among left-handers who were right-eyed (8.4%) as amongst left-handers who were also left-eyed (4.3%). He adds that such children often have difficulty in kinaesthetic control, especially of the finer movements, and mentions the frequent association of strabismus with the anomaly.

It is pointed out that the hands are differentiated early, one being used mainly as the active member, and for skilled and intricate manipulations, while the other (usually the left) is used for steadying, and for coarser movements. It follows, that when there is an innate tendency to use one hand hesitation in making a choice for each activity will be avoided.

Burt surveys the theories of handedness, and adds that he himself has studied many left-handed children in orphanages who had been brought up apart from

their left-handed parents, from whom they were separated in early infancy, and concludes that there is undoubtedly some inherited bias, which, however, in most cases, needs to be fixed by habit. He then describes two "congenital" types of left-handedness: (1) the "anatomical", where the left handedness appears to rest on a structural basis, and there is a general transfer of muscular dexterity from the right side of the body to the left -- in these cases the superiority of the left hand is outstanding in most tests, and the preference also affects the left eye and left foot. In such cases it has been suggested that there may be an inborn transposition of structural delicacy and functional superiority from the left cerebral hemisphere to the right hemisphere. In this type left-handedness is common in the family history. (2) the temperamental, where there is often reversal of one function only -- commonly the hand. There are frequently temperamental family traits and though there is left-handedness in the family history, it is not very frequent. Burt thinks that at bottom left-handedness of this type is no more congenital than the so-called "inherited diathesis".

Finally, Burt considers that hand preference is developed first and eye preference follows. He gives the following types and percentages:

(a) Where the left handedness seems predominantly acquired: 17%

(b) Where the left-handedness seems predominantly hereditary, occurring spontaneously, and found in the family history, with other left-sided signs: 36% ;

(c) Where an allied temperamental disposition seems inherited - a number of temperamental disturbances in the family history, but not very much left-handedness: 9% ;

(d) cases where the left-handedness seems to be completely spontaneous and there is no family history: 38%

He concludes therefore, that left-handedness may be a Mendelian recessive character -- but <u>not</u> a <u>simple</u> recessive.

In his observations of the "temperamental" cases, he notes a considerable amount of aggressiveness, stubbornness, and negativism. Unlike Blau, however, he considers that these reactions may be an effect rather than causal.

In the discussion of speech defects which follows, Burt notes that very many of these are due simply to bad habits, or organic defects, such as defective teeth, adenoids, or poor hearing. For the rest, he mentions two main factors: first a general emotional or intellectual maladjustment, and secondly a predisposing, often inherited weakness affecting the sensori-motor mechanism of speech. Some authors favour the first, some the second, but Burt believes both are usually involved, with some other -

appear to be those of Richard Eustis of the Language Clinic of the Massachusetts General Hospital (1947-1949). In the earliest of these papers, (1947)[33] Eustis mentions the conflict of opinion that has arisen between psychologists and educators on the one hand, and psychiatrists and a few (clinical) psychologists on the other, about the existence of any "specific" reading disability. In agreement with most of the authors mentioned above, Eustis is convinced that such a syndrome does exist, and that buried in the mass of "backward" readers, there is a hard core composed of non-readers of a distinctive type -- and that this small but specific group is only too often overlooked or swamped by the larger numbers of "non-specific" backward readers.

Eustis describes this small, distinctive group composed of boys predominantly, and most cases presenting some other anomalies of the language function in association: speech defect (defective articulation and/or stammer), motor speech delay, anomalies of handedness such as ambidexterity or undue clumsiness, are often found associated with the reading disability. He believes that all these associated anomalies are due to some inherited, sex-associated, weakness of the language function, combined with a tendency to ambidexterity. He adds that to explain the conflict of opinion between educators (lay opinion) and doctors (medical opinion), it must be assumed

that the groups studied were not identical and that in addition, different methods and standards were used in the various tests. He suggests that more co-operation between the two groups, and the use of more accurate definitions and standards in the future, should clear up these differences of opinion.

He nevertheless feels that it is essential now to differentiate between the mass of "reading disabilities" of the educators, and the more restricted "specific reading disability" of the psychiatrists. The importance of sifting out these special cases is obvious, as the general methods employed in training most backward readers -- constant drills, emphasis on visual methods etc. -- are often quite inappropriate for these children.

A considerable proportion of these cases are found to be above the average in intelligence and their assignment to "backward" or "special" classes had already been tried, but had produced increased retardation owing to further emotional blocking due to the increased feelings of inferiority. There was a high proportion of "ambidexterity" in this group - much higher than in the general population.

Eustis notes that many educators do not find a higher amount of left-handedness in these children than in normal readers, but that most doctors, who have studied this subject, do -- Orton[10], Cobb[34] and Creak[35], amongst others. He considers "ambidexterity" on incomplete dominance to be more closely

associated with the syndrome than crossed dominance of hand and eye (including here, eye-gaze); his theory about the basic difficulty (in specific reading disability) is that for part of the time (but only part), the direction of eye-gaze changes from L → R to R → L, and this causes confusion of letters (b, d, etc.), and words and syllables (was, saw, etc.), the typical reversal errors noted in the disability.

Eustis emphasises that there is a close association between specific reading disability and ambidexterity, but stresses his opinion that one is not the cause of the other. In a later paper (1947)[23] he again points out the association of speech defect and delay, specific reading disability, ambidexterity, and undue clumsiness, and suggests that they all arise from some underlying cause. This syndrome is specific and developmental; it is not due to disease, injury, or mental or physical abnormality; it is usual to find more than one anomaly in any one case, and sometimes three or four anomalies are found together. There is very frequently a family history of one or all of these anomalies. Family histories are often difficult to obtain, and as a rule it is only the severe disabilities that are remembered and reported. In spite of this, a familial tendency appears to be well authenticated and is accepted by Eustis.

When the anomalies are compared with the stages

of development in the normal infant, the parallelism is striking:

Normal Infant and Young Child	Patients with Syndrome
Ambilateral (clumsy with both hands)	Left handed or ambidextrous (L-handed often have more skill with R-hand too)
bodily clumsiness	undue clumsiness
no speech	late development of speech
stammers when excited	Stammer
unable to read	specific reading disability

It then seems obvious that the underlying cause must be a delay in development, and that all the anomalies might justifiably be described as "infantilisms". Some physiological cause must be found for this. Karlin and Kennedy (1936)[36] and Berry (1938)[37] suggest that a slow rate of myelination may be the cause. There is no absolute proof of this, but the theory certainly merits consideration.

It is widely believed that myelination and neuro-muscular maturation are closely associated. It is known that each child has its own individual "tempo" of maturation, and Eustis believes in a familial "tempo" of maturation also -- and families vary very considerably in the rate at which they acquire skills.

The development of the infant -- as shown above -- is slow and gradual, and depends on neuro-muscular maturation. Towards the end of the first year, the infant has acquired some skills with both hands, and preference for one hand is beginning to appear.

The first signs of speech and unilateral handedness are first evident at much the same time. The hand preference gradually strengthens, and laterality statistics have shown that the amount of left-handedness in the general population decreases with age, which suggests that the hereditary factor is not strong and is easily affected by training, except in the relatively few persistent sinistrals. The confirmation of handedness is therefore largely developmental, with habitual use constantly strengthening the original choice.

It is known that myelination proceeds in definite sequence which corresponds closely to the phylogenetic age of the tracts, the older being myelinated first, and the most recently developed -- that is, those forming the associations necessary for the highest skills of speech and unimanual dexterity -- last. It is known that some muscular activity is possible before myelination, but it is weak and diffuse in character. The rate of myelination is greatly increased after birth, this suggesting strongly that functional use stimulates the process -- and that full function requires full myelination (Langworthy 1933)[38]. Langworthy confirms that myelination does not begin until 12 to 16 weeks after birth, in the correlation centres or tracts of the cerebral cortex (those areas concerned with the highest and most recently developed functions), and that these areas are the last to become myelinated. Moreover

myelination is considered not to be completed in these areas, until adolescence, or between 15 and 20 years of age (Langworthy 1933).

In studies of child development, it has been found that skills are developed in a definite sequence also. The rate varies somewhat from child to child, but in general boys are one month or more slower than girls. It is believed that full attainment of any skill depends first on full myelination of the motor and association tracts concerned, and secondly, on practice. Langworthy (1939)[39] further correlates the appearance of many sensory and motor functions in the very young infant with the myelination of the tracts concerned, and confirms to a considerable extent the close association of myelination and neuro-muscular maturation, and therefore it is suggested that the observable development of neuro-muscular maturation may be an indication of the unseen degree of myelination.

Following upon this discussion, Eustis feels justified in assuming that (1) myelination is completed earlier in girls than in boys; (2) there is a family tendency to a certain "tempo" of myelination; (3) each child has his individual "tempo" of myelination, associated with his individual "tempo" of neuromuscular maturation; (4) an unusually early or unusually late neuro-muscular maturation in normal children in a normal environment implies equally early or late myelination;

(5) when one particular skill appears out of the normal order, either earlier or later than usual, it implies a correspondingly early or late myelination of the tracts concerned. He then applies these assumptions to the various anomalies described.

Ambidexterity: slow maturation prolongs the period of ambilaterality, and gives both hands a chance to acquire some skill. This habitual use of both hands for a longer period in childhood will carry over an unusual amount of skill with the non-preferred hand into adult life.

Left-handedness: prolonged ambilaterality (up to the age of 6) will raise the question in the parents' minds of whether the child is left-handed, and the left hand may then be chosen (mistakenly) for training. This is one -- quite common -- explanation for left-handedness.

Unusual bodily clumsiness: the awkwardness of early childhood is prolonged if neuromuscular control is slow in developing. The limbs are used awkwardly, and this awkwardness may later be fixed by habit. Training can overcome this, but is often much longer and more difficult than with normal children.

Specific Language Difficulties: these may all be considered as more localised forms of clumsiness affecting the neuro-muscular control of speech, or of eye-gaze (in reading disability). It is obvious that speech cannot begin until there is good control of the speech muscles. Karlin, Kennedy and Berry

have already indicated that slow myelination may be the cause of motor speech delay. Infantilisms (defects of articulation) are already normal in the infant, and may continue if neuromuscular maturation and myelination are slow -- and may later become fixed habits.

Stuttering is another sign of incomplete maturation. Anyone may stutter under stress, and these children stutter under minor stresses, especially at periods of developmental strains, when speech is beginning, when written language (reading) is beginning, or, less commonly, at adolescence. Fright or illness may make one of these potential stutterers into an actual one. Delayed maturation has given these potential stutterers a speech mechanism functioning too slowly and clumsily to cope with the increasing flow of ideas. The mechanism may break down momentarily (speech block) or become disorganised (repetitions). The effort to force speech causes the varied accessory movements, and later emotional tension tends to fix the stammer.

Specific reading disability: the essence of this disability is uncertainty in spatial orientation, and a confusion between right and left, with a tendency to reverse the eye-gaze-direction at intervals. Most children do this when they are first being taught to read, especially if they are being taught by the "whole-word" or sight method. Prolonged ambilaterality in early childhood prolongs

the period of confusion; the slower the maturation, the longer the confusion, and the longer the period of confusion lasts, the more likely are these habits of occasional reversal, to become fixed. Eustis believes that a slow rate of neuromuscular maturation, by prolonging the normal period of spatial confusion in hand and eye, is the primary cause of specific reading disability.

He comments finally, that slow maturation seems to be the only factor all these anomalies have in common. They are probably all derived from it, and therefore an inherited slow "tempo" of maturation or myelination may be the fundamental -- and essentially physiological -- cause. In addition, of course, he notes the important part played by psychological factors in stutter, and by psychological and educational factors in specific reading disability, but considers that these are probably not primary.

If this theory is accepted it follows that treatment and training must be instituted early, before the faulty patterns become fixed by habit -- whether these patterns are of speech, or eye-gaze-direction.

TWENTY-FOUR SELECTED CASES.

In this section of the thesis, twenty-four cases showing anomalies of dominance are presented. Before beginning this presentation, however, it is first necessary to discuss both the type of test used in the examination, and the particular functions that are to be tested.

Investigation of Cases:

In the first place, laterality -- that is, the choice of a preferred side -- can refer to various parts of the body, in particular to the hand, to the eye, and to the foot. In our present culture, the hand and the eye are both important, but the laterality of the foot is less so, except perhaps in sport. In this investigation, therefore, much more stress is laid on handedness and eyedness.

There have been many tests devised to decide handedness, but the results have varied greatly, according to the number and type of test employed. H.D. Chamberlain,[13] for instance decided handedness on writing alone, while others have tested much less skilled activities, on the theory that these would show the "native" handedness, less affected by training. The occurrence of a native, inborn tendency for the use of one hand is affirmed by Gordon (1921),[40] Orton (1937),[10] Gesell (1947),[17] Eustis (1949)[16] and others, but is largely denied by Blau (1946).[5]

For the diagnosis of handedness, Blau gives a lengthy (subjective) questionnaire, which, however,

is less useful than a smaller number of selected objective tests. Owing to the common feeling -- often very strong -- that left-handedness is something to be ashamed of, the subjective method is liable to be inaccurate.

It is also important in these tests, that repeated trials should be given. This is also necessary when testing for eye dominance, but is equally important for unskilled manual activities. Again, on account of the inferiority feelings so often associated with sinistrality, it is advisable to perform the tests without allowing the subject to become aware that he is being tested for laterality. In practice, the most satisfactory results were obtained when the various tests were arranged, either as a sort of game, or as a test of speed, and when tests for eye, hand, foot, and attainment tests were all mixed up together.

Hand Tests: A battery of tests for handedness was devised to include both skilled and unskilled activities. Following Gordon's (1921)[40] methods, the child was asked to pick up a duster and polish the surface of the table; then he was asked to roll the duster into a ball and throw it into a basket at the other side of the room -- about nine feet away. These two tests were repeated three times, at intervals. The next test was to pick up twelve counters and place them in a box, as quickly as possible, while being timed with a stop watch. These three activities are

unskilled -- and a note was taken of the hand used most. Incidentally, Gordon's observation that it was essential to see that the child started off with both hands free -- not holding a handkerchief or a sweet, nor being kept in the pocket -- proved very pertinent.

The next three tests were of more skilled -- or learned -- activities, again based on Gordon's suggestions. The first was to cut a strip of paper with scissors, specially prepared with blunt blades and a loosened holding rivet or screw. It was found that left-handed children could cut with these scissors in the left hand, but usually failed completely when using the right hand, while right-handed children were unable to use the scissors in the left hand. On the few occasions when a child succeeded in cutting with both hands, enquiry usually elicited the fact that the child had been accustomed to cutting the nails of both hands.

Next, the child was asked to wind a yard of fine string on to a reel. The dominant hand is the hand that winds, whether it holds the string or the reel. With those children who appeared to move both hands equally, each hand was fixed in turn, and the winding was timed with the stop watch, the dominant hand being the quicker.

The last test in this series of skilled tests was the line test: the child was asked to make as many short ($\frac{1}{2}$") vertical lines in pencil, as possible in

15 seconds, first with the right and then with the left hand. The hand making the most -- and usually also the neatest -- lines is the master hand. In many cases with "ambilateral" tendencies, the performances of both hands approximated closely. It was not considered necessary to repeat these tests of skilled activities more than once.

To conclude the testing of handedness, the child was asked to write his name, first with his usual (writing) hand, then with the other. He was also asked to attempt mirror-writing with each hand, after seeing it demonstrated if necessary. The number of tests could be multiplied almost indefinitely but for practical purposes, these three tests of unskilled activities, three further tests of skilled activities, and the writing tests for both hands were considered quite adequate.

The results gave varying degrees of handedness, from strongly right-handed to strongly left-handed. The results are indicated in the cases, and tables, as follows:-

R means complete right-handedness.

R + l means mainly right-handed, but with some left-handed activities, or more facility with the left hand than usual.

R + L shows almost equal facility or skill with both hands, with a very slight bias to the right.

L + R resembles the foregoing, but with the slight bias to the left.

L + r shows left-handedness, mainly, with a little right-handed skill or facility.

L indicates complete left-handedness.

No child was found to be truly ambidextrous, though some (R + L, and L + R) used each hand with a fairly high degree of skill, but for different activities.

Eye Tests: The question of eye tests has similarly given rise to many theories and to many tests. Parson (1924)[19] used his manoptoscope in his investigations, but later observers decided that this method did not give dependable results.

Buxton and Crosland (1937)[20] have studied this problem and have pointed out that two techniques have, in general, been used: one determines the "amount of preference" in a given situation; the other repeats a simple test frequently, with slight variations, and combines the results. In this investigation, the second method was followed. Most of the tests were modifications of the sighting test, involving the lining up of a near object with a fixed distant one, and recording whether the object is in the right or left line of vision.

Buxton and Crosland found the hole-in-card test satisfactory (also used by Orton)[27], so this test was adopted: a card 12" x 20" with a hole in the centre, $\frac{1}{2}$" in diameter is held by the subject with both hands, and he is asked to read letters printed on cards, at a distance. The eye used was recorded and ten observations were made, at speed, without allowing the subject time to think about his choice. The

second test was also taken from the Buxton and Crosland series: a truncated cone of cardboard, large enough to fit over both eyes, and with a small aperture at the distal end, was used. The subject held it with both hands over both eyes, and was asked to tell the colour of counters held just below the examiner's right eye. Again, ten repetitions were used, and the eye recorded. The third test was devised by Anderson and Weigall (1944)[21], and on the whole, this test gave the most consistent and dependable results. A cylinder, 8" long and 2" diameter, is held with both hands, and swung up at arm's length for the subject to look through at an object (a playing card was used) held just below the examiner's right eye. The object can be seen along one visual axis only, and the eye used was recorded, again in ten trials.

In the last test, a modification of one of Orton's[27] tests was used, which indicated the occasional influence of hand on eye, which must be controlled in all such tests. A toy telescope was used and the child asked to look at small objects across the room. The telescope was held in each hand alternately until ten trials had been given.

As suggested by Buxton (1937)[41] in a later paper, ten trials were made, each use of the right eye being recorded as + 1, and of the left as - 1, so that a range between + 10 (strongly right-eyed) and - 10 (strongly left-eyed) was possible. In the fourth test however, the combinations of eye and

hand were recorded separately. The final results of all the eye tests are summarised in the same manner as the tests for handedness.

Foot Tests: As noted above, foot preference appears to be of little importance except as a guide: it is only in sports, such as football, that strong foot-preference assumes any importance. The tests employed were four in number, and the results were confirmed, in some cases, by a period of observation. The child was asked to hop across the room, and the weight-bearing foot was recorded. He had then to kick a cork, placed in the mid-line, about 1' in front of him. He was asked to go up a small flight of stairs, and the foot used to step up first was recorded. Lastly, he was asked to lean forward as far as possible -- till he had to step forward to regain his balance, and the foot used thus was noted.

Intelligence and Attainment Tests: All children were given intelligence tests, and most received attainment tests as well, so that an educational profile in graphic form could be made.

The main intelligence test used was the latest Terman-Merrill revision of the Stanford-Binet test, employing form L. This was followed by the Alexander Passalong test, as a rapid and rough test of practical ability. A note was taken also, during this test, of the hand used to manipulate the blocks, this usually agreeing closely with the results of the tests of handedness. The Progressive Matrices (1938)

were then given, but with the younger children, the 1947 variant was used.

The reading attainment test used was Burt's[42] graded vocabulary test, from which the child's reading age was obtained -- and also the type of error made. Burt's writing speed test and writing quality test followed, and an average taken to give a"writing age". For the testing of spelling, Burt's graded vocabulary test was used for oral spelling and his dictation test for written spelling, and an average taken to give the spelling age for the profile. Arithmetic was tested by Burt's graded oral test, as this was considered to be less likely to reflect difficulties arising from any reading or writing disabilities.

In addition to these intelligence and attainment tests, most cases with reading and spelling disability were tested by Monroe's[31] test of auditory word discrimination (pairs of words, some the same, some different), and finally, Schonell's[43] test of "directional attack on words".

All cases with educational disabilities had their vision tested, and had a rough test of hearing, but all doubtful cases were tested with the pure tone audiometer in addition.

A full family history was obtained about each case (except one, a boy adopted in infancy), and special enquiry was made in these histories about the presence of left-handedness, ambidexterity, delay in speaking, defective speech (articulation), stammer, and diffi-

culty in learning to read, amongst parents, siblings, and grandparents, where possible. It was significant that in several cases there was a clear history of reading difficulties, although this is not a disability that is usually easily remembered.

As many writers, notably Anderson and Weigall,[3.1] and Burt,[14] have noted that strabismus is often associated with anomalies of language, and laterality, this defect was also enquired about. The occurrence of twinning (described by Gordon[40] and others, but denied by Blau[5]) in the family history of these cases was also noted, and any other nervous or mental abnormality.

Description of Cases:

In most of the cases which follow, there are diagrammatic representations of the Family Tree, and of the Educational Profile.

In the Family Tree, the case under discussion is marked in red, and all relatives with significant traits are shown by solid black symbols. The contractions used to indicate these traits are as follows:-

L H: left-handed;
A D: ambidextrous (or ambilateral);
C S: converted sinistral;
R D: reading disability;
W D: writing disability;
S D: speech defects -- including motor speech delay, defective articulation, and stammer;
A: apraxia or motor awkwardness;
S: convergent strabismus;
E: epilepsy;
M D: mental deficiency;
N: other nervous traits;
T: twinning.

For the Educational Profile, the graph shows the child's class (with the average age), chronological age (CA), mental age (MA), arithmetic age (A), reading age (R), spelling age (S) and writing age (W).

CASE I.

Alistair K. Born: 11.7.36. First seen: 20.9.45.

General:

School: independent preparatory school.

Social Status: professional class -- both parents doctors.

Problem: This boy was referred on account of scholastic backwardness. Though bright and intelligent he was unable to learn to read. He developed extreme obstinacy and temper tantrums.

Clinical Report and History: This boy's early development was uneventful. He walked at a year, but did not talk until he was over 2, and then spoke well, using 3 - 4 word sentences. He showed a tendency to left-handedness up to 18 months, but was easily trained to right-handedness. By the time he reached school age he appeared to be completely right-handed, but liked to throw balls with his left hand. He began school at 5, but could hardly read at all when he was 7. Pressure was put on him by his parents who had high standards, but this produced extreme obstinacy, and he showed signs of regression, becoming very babyish in manner, and persistently sucking his thumb. He was transferred to the preparatory school at the age of 9, and the disability was discovered for the first time.

Family History: On the mother's side there was a definite history of ambidexterity and left-handedness, speech defect, and convergent strabismus. There was

no significant history on the paternal side. Both families were above the average in intelligence.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 120.
Alexander Passalong:	I.Q. 116.
Progressive Matrices(1938):	Grade II.

Attainment Tests:

Reading Age:	6.8.
Spelling Age:	6.
Writing Age:	6.5
Arithmetic Age:	8.8

See Profile.

Degree of Disability: Reading was more than two years retarded -- more, in comparison with mental age.

In the reading tests there were frequent reversals of the kinetic and static type -- "b" for "d", "p" for "q", "n" for "u" etc. In reading he never used the word-whole method, but spelt every word out orally -- usually reading them correctly in the end. Oral spelling was a little better than dictation, but both were very poor. Writing was painstakingly neat -- with a slight backward slope -- but was extremely slow. Copying was usually correct, but there were many reversals of letters and words when writing to dictation.

Clinical Features: The disability was the typical specific one affecting reading and spelling --

arithmetic was not affected. His temper tantrums, sullenness and obstinacy were secondary symptoms arising from acute sense of inferiority -- and punishment at school. He was found to be mainly right-handed, and strongly left-eyed, when the disability was discovered. Vision in both eyes was normal, and hearing acute.

Clinical Handling and Progress: Special coaching was instituted at once: half-an-hour daily for three months, and thereafter at weekly intervals for a year. Phonetic methods were used, and the boy was encouraged first to trace letters, and later to point with his right index finger when reading. After the first period of intensive coaching, he began to do much better. His reading improved up to his class level. Constant encouragement and reassurance were given, and praise was generous. He moved up in class to 4th place, and two years later he jumped two classes. The behaviour problem has entirely cleared up, and he is now well behaved, and equable in temperament.

He is now in his proper class for his age. His reading age (at 13$\frac{5}{12}$) is now 14. For the past two summers he has been shooting at school and using his right eye for sighting. When his eyes were tested for dominance in December 1949, his right eye had become the master eye.

Particular.

Intelligence Tests in Detail.

When doing the Stanford-Binet Test he did very well until he came up against reading difficulties, when he refused to try. He did well in the tests involving memory and number. There was no abnormal scatter.

In the Passalong Test he was interested and quick -- took time to consider a plan of action, then acted on it quickly. Nevertheless, perseverance was lacking when he came up against difficulties.

In the manipulations he sometimes used the right and sometimes the left hand to move the blocks - about 50 - 50.

In the Progressive Matrices his score was consistent and he reached Grade II, at the 84th percentile point level.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	L.	Winds:	Both hands. R quicker than L.
Counters:	R.	Lines:	R 29. L 20.

Writing: Right hand writing very neat with backward slope.

Left hand writing poor, but mirror writing with left hand very good and rapid.

He is therefore graded as R + 1.

Tests for Footedness:

He kicks with either foot in football, but kicked the cork with his left foot. All other tests showed the right foot to be dominant.

Tests for Eyedness:

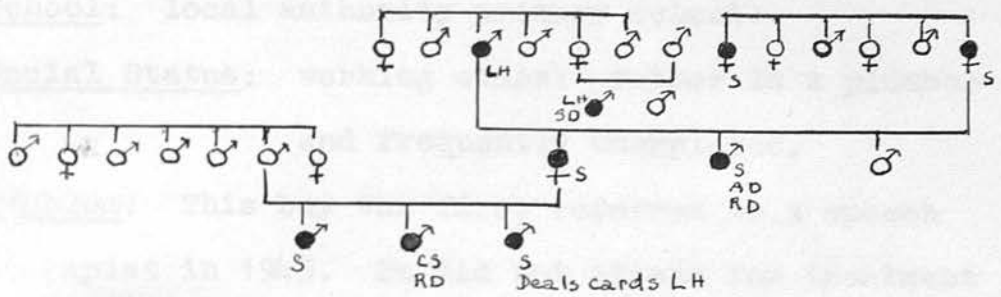
Hole in card:	-10
Cone:	- 6
Cylinder:	-10
Toy Telescope:	RH + LE = 4 RH + RE = 1 LH + LE = 5

The left eye is dominant.

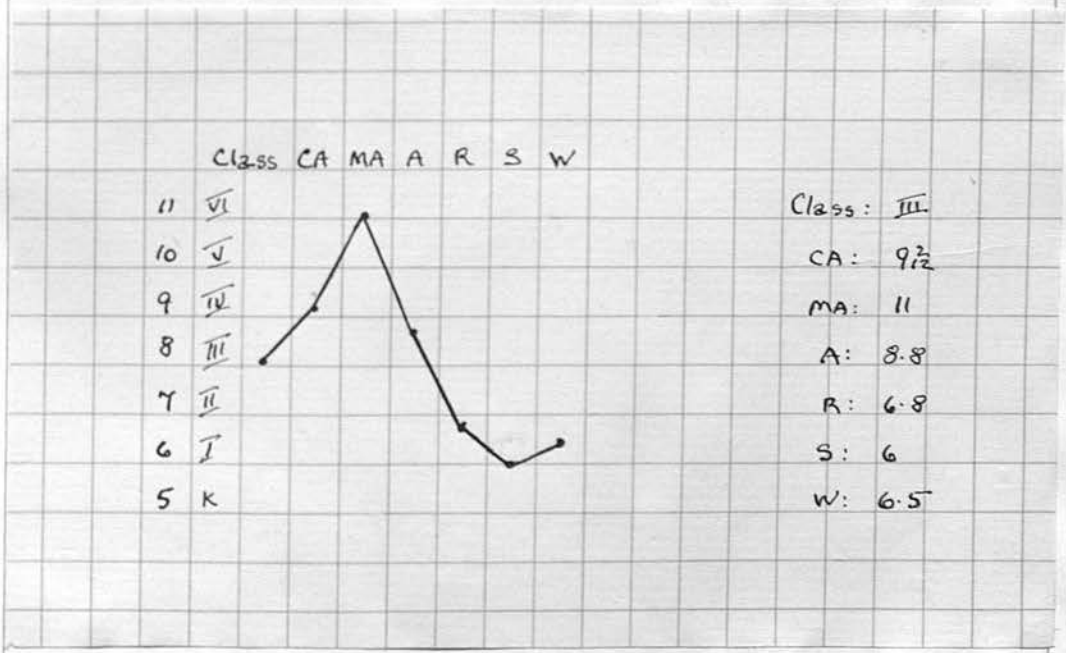
This boy has a dominant left eye, and a largely dominant right hand -- he shows crossed dominance, but in view of the history, is probably a shifted sinistral.

Case I. Alistair K.

Family Tree.



Profile.



CASE II.

Jim McD. Born: 13.5.42. First seen: 27.6.47.

General:

School: local authority primary school.

Social Status: working class: father is a plumber and frequently unemployed.

Problem: This boy was first referred to a speech therapist in 1945. He did not attend for treatment however, and in 1947 returned again, with a very severe stammer, and uncontrollable aggressive behaviour.

Clinical Report and History: Jim was a normal baby, but began to stammer when he was 2 -- six months after he began to speak. His stammer was very variable, from a complete blockage on one occasion, to complete absence on others. He has also a lisp. Since he started school at Easter, his stammer has got much worse, and he has become hyperactive, aggressive, and cruel to other children.

He writes with his right hand now, but his mother states that he used both hands equally until he went to school.

Family History: There is no family history of left-handedness, speech defect or other language disability. His maternal grandfather was asthmatic. There is a history of twins on the mother's side.

Intelligence Tests:

Stanford-Binet: I.Q. 119.

Alexander Passalong: I.Q. 134.

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Intelligence Tests:

Stanford-Binet: I.Q. 119.

Alexander Passalong: I.Q. 134.

Intelligence Tests, continued:

Progressive Matrices (1947): Grade II+.

At school he is doing reasonably well and there is no specific educational disability.

Degree of Disability and Clinical Features:

The stammer is so severe, that at times the boy can hardly speak. The main delay is in beginning words, and affects all types of initial sounds. In addition he has quite a severe lisp. Since he began school he has developed many accessory movements -- in particular, one of raising his right hand above his head. He was laughed at by his school fellows, and became very noisy, aggressive and bullying in manner. His hearing is normal, and word discrimination is good. His reading was slow but correct.

He used his right hand for writing and most other activities, but was left-eyed.

Clinical Handling and Progress:

Jim received routine speech therapy -- relaxation breathing exercises, and additional exercises to cure the defect of articulation. Rhythmic drawing and painting patterns were also used -- for the right hand exclusively, and he was encouraged to use his right hand only for all unimanual activities. He also attended for group play therapy. After two years, his stammer has shown very considerable improvement and is completely absent for long periods. The lisp is less noticeable. The behaviour is much less aggressive and he is now socially well adjusted.

He has had no educational difficulties, but when he was tested by Schonell's directional test, he had ten mistakes, all reversals, which however, he corrected spontaneously.

Particular.

Detailed Intelligence Tests:

He showed great interest and cooperated well in the Stanford-Binet test. His memory was good, especially for numbers, while his comprehension and reasoning powers were also above the average.

In the Passalong test, he was quick, eager and persistent, and showed a high degree of practical ability. He thought out his moves beforehand, and then manipulated the blocks purposefully. He moved the blocks with each hand in turn, with a slight preference for the left hand.

He enjoyed doing the Matrices, and did well -- scoring at the 90th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	R. + L. equally.	Lines:	R. 33. L. 35.

He writes well with his right hand but shows almost equal facility with his left. He can use mirror-writing with ease, though this is much better with his left hand. He is therefore mainly right-handed, but has some facility with his left hand -- R + l.

Tests for Footedness:

He is entirely right-footed -- he used his right foot

in every test.

Tests for Eyedness:

Hole in card:	- 8.
Cone:	- 6.
Cylinder:	-10.
Toy Telescope:	LH + LE = 5. RH + LE = 4. RH + RE = 1.

He is strongly left-eyed.

This boy therefore shows crossed dominance, being left-eyed, and mainly right-handed. Development of hand dominance was delayed.

CASE III.

Michael A. Born: 27.3.34. First seen: 10.11.47.

General:

School: local authority primary school.

Social Status: professional class -- father is a major in R.A.M.C.

Problem: Backwardness at school, put down to stubbornness and stupidity. Suspected of pilfering at home.

Clinical Report and History: This boy was born in India, and owing to his father's occupation, had a very unsettled life. His early development was uneventful, but he did not speak until he was over 2. He started school at 4, at a kindergarten, then at a preparatory school in England at 5, then at 6½, the preparatory department of a public school in Ireland.

He was unable to learn to read, and was kept at home for a year with a governess, getting individual -- but unskilled -- attention. He returned to school at 8 and remained there till he was 13. He was compared all the time with his elder brother -- most unfavourably. He was called stubborn, lazy, and was frequently beaten. He did not complain, but looked miserable, and other boys told what was happening. He was removed from this school and sent to the local primary school, but felt the "disgrace". deeply -- and began to pilfer at home. He is in good physical health and well adjusted socially with

his contemporaries.

He suffered from frequent recurrent attacks of otitis media with some dullness of hearing until he was 12, but since tonsillectomy then, he has had no further trouble and his hearing is now good. Auditory word discrimination is normal, and vision good.

He is in a class with an average age 18 months younger. He is up to standard in arithmetic and handwork, but at the bottom of the class in all "reading" subjects.

Family History: Mother and sister have convergent strabismus. There is no other significant family history in the parents' generation, but Michael's brother is left-handed.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 106.
Alexander Passalong:	I.Q. 119.
Progressive Matrices (1938):	Grade II.

Attainment Tests:

Reading Age:	7.5
Spelling Age:	7.5
Writing Age:	9.5
Arithmetic Age:	13.8

See Profile.

Degree of Disability: The reading disability was severe causing six years retardation. He was slow and painstaking with his reading, pointing to the

words, and spelling them out orally. There were many omissions of word endings, but the most common errors were reversals, a few static, but the majority kinetic. With Schonell's test, he made 22 mistakes -- all reversals -- but corrected every one, when told he was wrong. Writing was slow, ill-formed, and showed reversals also.

Clinical Features: The disability in this case -- of the typical developmental reading disability type -- was undoubtedly aggravated by the constant changes in this boy's early education. It is also highly probable that the impairment of hearing which was present during most of his school life, increased his difficulties. Shortly before his referral to the clinic, his father returned home permanently, and became most dissatisfied with the boy's progress. As a result of the constant criticism, unfavourable comparisons and pressure, the boy became anxious, hostile and began to steal at home (the mother was quite certain of this, but shielded the boy from his father). He is right-handed, but has a left eye preference.

Clinical Handling and Progress: Advice was given to the parents to avoid pressure and criticism. The boy had his disability superficially explained to him, and he was reassured about his intelligence, and about the outcome.

Arrangements were made for him to go to a small boarding school, and to have extra tuition in

reading, spelling and writing on the lines recommended by the clinic -- mainly phonic word drills and the Marion Richardson writing methods.

He has now been at the school for eighteen months, and has shown a steady improvement. He is socially self-confident, placid, and happy - pilfering has never recurred. He is doing very well in science and mathematics and his verbal subjects have improved very greatly. His reading age is now 12.2, and writing age 12.5. He has begun to read for pleasure -- and is planning for a University course in engineering, and realises he must put in a considerable amount of extra work -- the concentration and perseverance he is now showing, suggest that he will succeed.

Particular.

Intelligence Tests in Detail:

He lacked confidence when doing the Stanford-Binet Test -- was very slow in his responses, and reluctant to risk answers if he was in any doubt. Comprehension and memory were good, especially for numbers. He was poor in the paper cutting, and verbal tests.

In the Passalong he was keen and interested. He worked quickly and accurately, reasoning out his moves in advance, showing very little of the trial-and-error method. Both hands were used equally for manipulation.

In the Progressive Matrices (1938) he completed the early tests very quickly and concentrated on the more difficult ones. His score brought him to the

level of the 75th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	Both hands used. When one fixed and winding hand timed, R took 8 seconds, L took 9 seconds.
Counters:	R.		
		Lines	R 26. L 24.

There was no facility in writing with the left hand, and he failed in mirror writing with either hand. Both the winding and the line tests suggest that there is not very much difference between the hands, but the writing shows definite right dominance -- R + 1.

Tests for Footedness:

He shows dominance of the Right foot in every test.

Test for Eyedness:

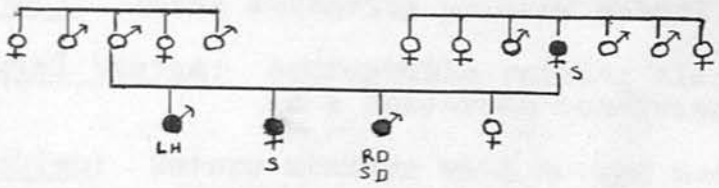
Hole in card:	-4
Cone:	-4
Cylinder:	-6
Toy Telescope:	RH + RE = 4 RH + LE = 1 LH + LE = 5

The dominant eye is the left, though the preponderance is not exceptionally strong.

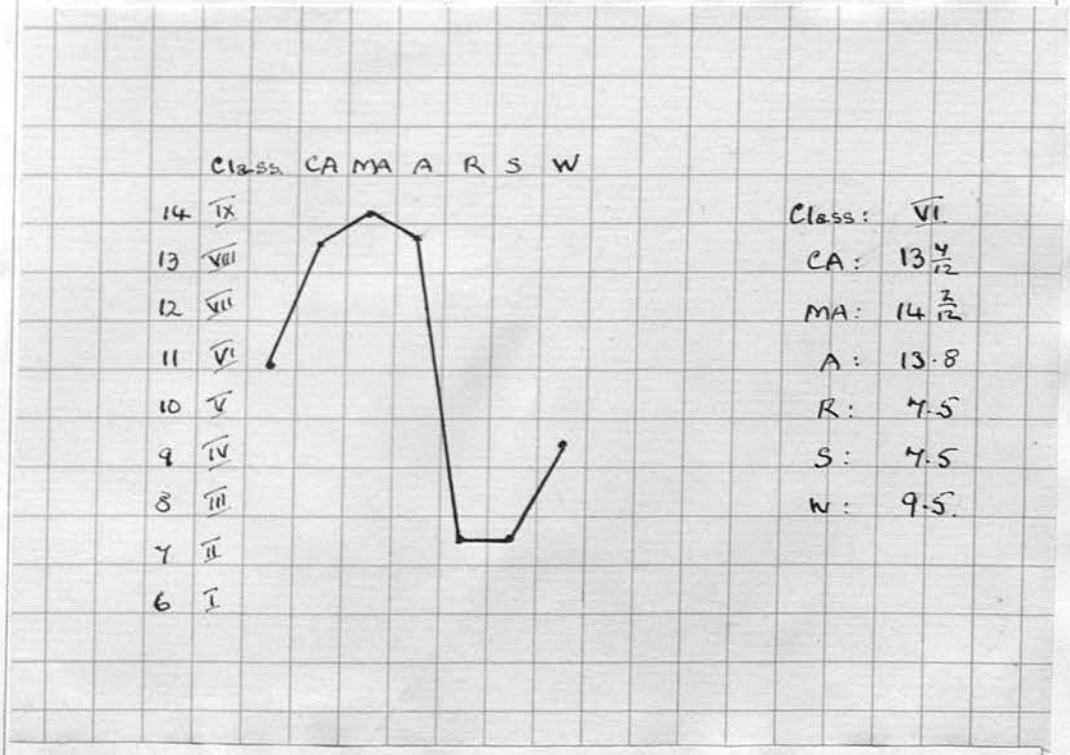
This boy shows crossed dominance, though the preponderance, or dominance of hand and eye is not at all strong -- dominance is, in general, weak or incomplete.

Case III. Michael A.

Family Tree.



Profile.



CASE IV.

Crawford R. Born: 27.7.38. First seen: 4.6.48.

General:

School: local authority primary school.

Social Status: comfortable working class -- father is a boilerman receiving good wages.

Problem: Severe stammer with marked accessory movements.

Clinical Report and History: This boy is the elder child in a family of two. He was a premature baby, labour being induced at 8 months, as the mother had very severe kidney trouble. He was no trouble as a baby, and walked at the age of 10 months. He was easy to train, and soon learned to feed and dress himself. Speech however was markedly delayed: he did not begin to speak until he was $3\frac{1}{2}$, and had a severe stammer and defective articulation from the beginning. These symptoms became much worse when he started school, and he had very great difficulty in learning to read and write. His mother was surprisingly annoyed when asked if he was right-handed, and was most positive that he had always been so. On further enquiry however, it appears that he was late in choosing a hand -- nearly 4 -- but that the choice then was for the right hand. Physical health is satisfactory. His vision is normal, and audiometer tests showed no defect of hearing. He is, however, colour blind. He was always happy, contented, and socially well adjusted, though he is still

subject to enuresis in periods of excitement or strain.

Family History: All the mother's siblings showed speech delay, two severely. The father has a slight stammer and is colour blind. Crawford's sister is an imbecile of $3\frac{1}{2}$, not yet making any attempt at speech.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 76.
Alexander Passalong:	I.Q. 124.
Progressive Matrices (1938):	Grade V.

Attainment Tests:

Reading Age:	4.8.
Spelling Age:	4.6
Writing Age:	speed slow, quality poor. 6.5
Arithmetic Age:	7.5

See Profile.

Degree of Disability: This boy's speech defect was very severe -- he had great difficulty in beginning words, and his whole body was involved in the accessory movements. He had also defective articulation of g, r, and k sounds. Word discrimination (auditory) was normal however.

He also showed considerable difficulty in reading and writing. He was in the dull and backward group, with an I.Q. of 76. His arithmetic was up to the standard of his mental age, but his reading and

writing were far below this. He confused his letters badly, especially "b" and "d", "t" and "f", "u" and "n", "p" and "q" and static and kinetic reversals were very frequent. His writing was slow and ill-formed, and also showed letter reversals.

Clinical Features: This boy showed marked disabilities affecting all the language functions -- speech, reading, writing and spelling (although there was no auditory imperception). In spite of these deficiencies, he was happy and well adjusted most of the time, but reacted to undue pressure at school by nail biting and enuresis. He was found to be right-handed, though this was late in development, and is strongly left-eyed.

Clinical Handling and Progress: Speech therapy of the routine type was instituted -- breathing exercises, relaxation, and special exercises for the defect in articulation. These were combined with painting, tracing and writing patterns of the Marion Richardson type.

Although this boy had a low I.Q., it was felt that his scholastic failure was increased by the specific language disabilities, so remedial coaching was attempted, and the results have been quite encouraging. He was trained by the phonic method -- especially in the blending of small phonic units -- and encouraged to point and trace with his finger (R. index) when reading.

By December 1949 his speech had improved greatly:

the defective articulation had been corrected, the stammer was only slight, and the accessory movements entirely absent. His reading age had improved to 7.9 and is rapidly approaching his mental age. His writing has improved even more, and is now up to his chronological age -- he has obviously been helped by his practical ability as indicated in the Passalong Test.

Particular:

Detailed Intelligence Tests:

He was slow and cautious in the Stanford Binet test, and stammered very badly in its administration. There was very little scatter, but he failed earliest in the tests involving comprehension and reasoning. He is intellectually dull with an I.Q. of 76. By contrast, he did very well in the Passalong test. He was exceptionally quick in the first six sub-tests and his practical ability quotient was 124. He used the trial-and-error method very little until the end, when he was unable to proceed. In the test, he used his right hand exclusively for manipulation.

His results in the Progressive Matrices were very poor, his scores being very low, at the level of the 5th percentile point on the scale. He seemed quite unable to work out the patterns required.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	used both hands to pick up - equally.		
		Lines:	R. 43. L. 32.

He writes with his right hand, and shows no facility at all with his left. He could not write mirror fashion with either hand.

He is predominantly right-handed.

Tests for Footedness:

He used his right foot invariably in every test.

Tests for Eyedness:

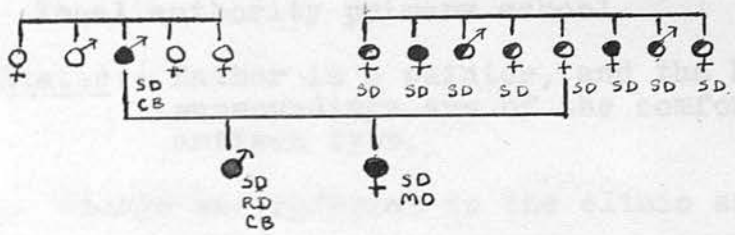
Hole in card:	-10
Cone:	-10
Cylinder:	-10
Toy Telescope:	LH + LE = 5 RH + LE = 4 RH + RE = 1

He has a strongly dominant left eye.

He therefore shows crossed dominance, and the history indicates that hand dominance was late in being established.

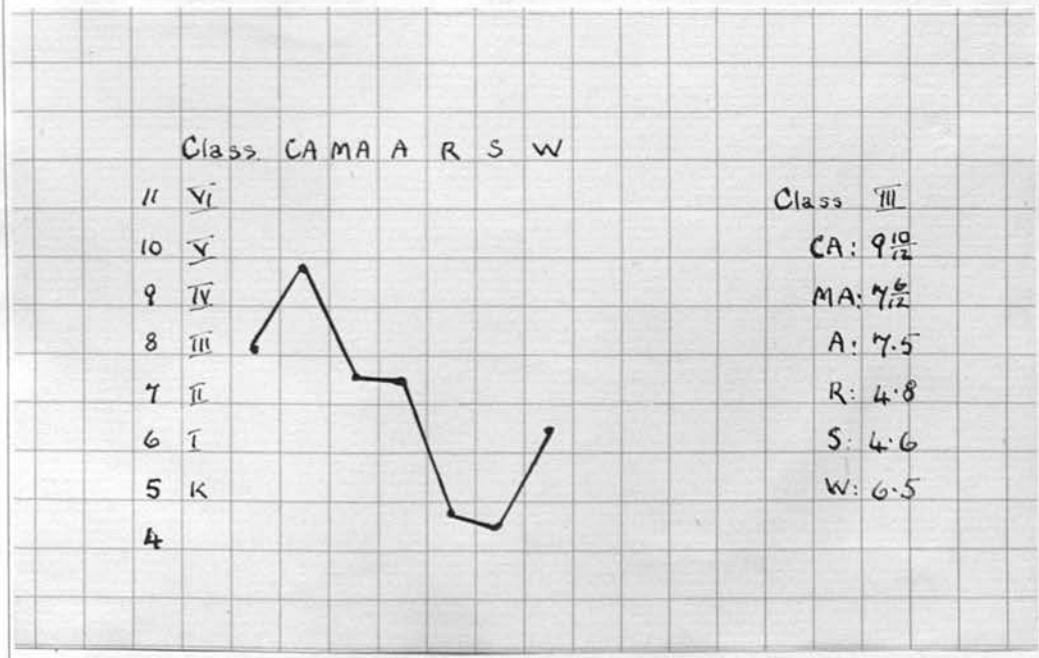
Case IV. Crawford R.

Family Tree.



C B = Colour-blind.

Profile.



CASE V.

George H. Born: 30.1.40. First seen: 8.7.48.

General:

School: local authority primary school.

Social Status: father is a painter, and the home surroundings are of the comfortable artisan type.

Problem: George was referred to the clinic as possibly mentally defective. He failed at school and had become enuretic.

Clinical Report and History: This boy has been at school for three years and has not yet learned to read or write. He is happy at home but is very anxious and worried at school, where he is teased about his slowness and stupidity. He has developed a nervous twitch of his mouth, and is enuretic three or four nights weekly. His early development was normal, he walked early, and began to talk at about 18 months. He is socially well adjusted and gets on well with other children, although he prefers to be with his father, helping him to paint. There was no trouble until he had been at school for a year, when the enuresis started. He is in good physical health, and both hearing and vision are unimpaired. His mother states that he has always been right-handed.

Family History: There is a strong family history of reading difficulties: the father and two paternal aunts had -- and still have -- great difficulty in reading and writing, although not mentally defective. The father is ambidextrous and strongly left-eyed.

The mother is also ambidextrous, and had a convergent strabismus -- she is also very nervous, and had a slight stammer when a child. There were twins in both paternal grandfather's and maternal grandmother's families.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 91.
Alexander Passalong:	I.Q. 91.
Progressive Matrices: (1947):	Grade III-.

Attainment Tests:

Reading Age:	4.6.
Spelling Age:	4.5.
Writing Age:	5.
Arithmetic Age:	7.5.

See Profile.

Degree of Disability: Although George had been at school for three years, his reading was only at age 4½ level. He reversed all the similar letters -- "b" and "d", "p" and "q", "n" and "u", and was also very confused about the order in words. He can read very few three letter words, and reverses these constantly. His writing is very slow, and the letters are badly formed and irregular. When asked to write "dog" he produced "gob".

Clinical Features: This boy's adjustment at home is very satisfactory: with the same disability present in several relatives, there has been no tendency to make the boy feel inferior. At school however

pressure was harsh and continued, and in March 1948, he was moved into a higher class, under an unsympathetic teacher. He then developed the facial tic, and became enuretic.

Clinical Handling and Progress: It was discovered that he was of (low) average intelligence, and that though mainly right-handed, he was strongly left-eyed. Remedial coaching was instituted at once: the Marion Richardson method of writing patterns and writing was used: he was encouraged to trace his letters, and to feel wooden ones: he also pointed with his finger when reading. For reading, the oral (phonetic) method was used at first, with little use of the flash card, or word-whole method. Progress has been definite, but slow. Owing to the long period of outright neglect at school, he had formed a habit of day dreaming, and lacked concentration. His reading age is now 6.3, with kinetic reversals as the main error still; spelling has improved in proportion. His writing shows very great improvement in both speed and quality. The tic has been absent for 9 months, and in the last six months he has been enuretic only four times.

Particular.

Intelligence Tests in Detail:

In the Stanford-Binet he showed marked lack of concentration, and very poor memory for number. There was no scatter.

In the Alexander Passalong test, he had an I.Q. of 91.

In some of the more difficult sub-tests, he wasted a lot of time trying to turn the blocks, but after he gave this up, he completed each sub-test quickly. He manipulated the blocks with both hands, with a slight preponderance of right over left.

In the Progressive Matrices (1947) his results were rather poor. He only reached Grade III-, at the 25th percentile point. Throughout this test, he traced the patterns with his finger, using kinaesthetic memory to reinforce the visual.

Tests for Handedness:

Rubs:	R.	Scissors:	R. (failed with L).
Throws:	R.		
Counters:	R + L together.	Winds:	R.
		Lines:	R. 31 L. 28

He writes with his right hand, but shows considerable facility in left-handed writing. He also does mirror-writing very well with his left hand.

He is classed as right-handed, with some left-handed facility -- R + l.

Tests for Footedness:

He kicks with his left foot, and hops on his left foot. He regains his balance with his right foot. He showed no foot preference in going upstairs. In all he showed a slight tendency to left-footedness -- L + r.

Tests for Eyedness:

Hole in card:	-10.
Cone:	- 8.

Tests for Eyedness Continued:

Cylinder: -10

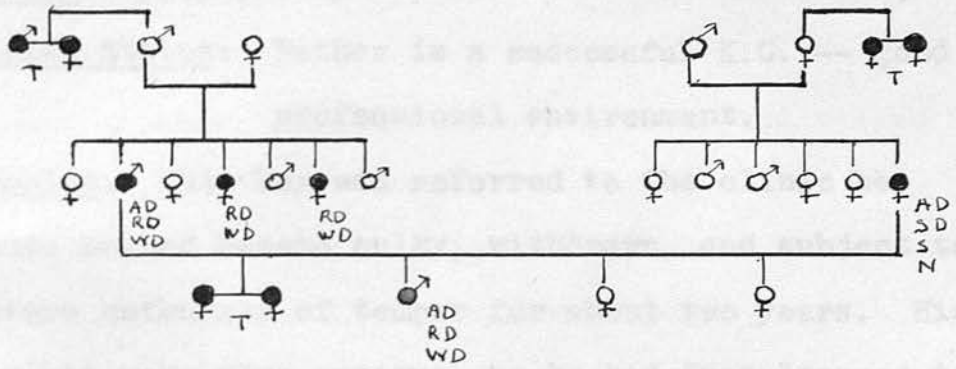
Toy Telescope: RH + RE = 1
RH + LE = 4
LH + LE = 5

He is therefore dominantly left-eyed.

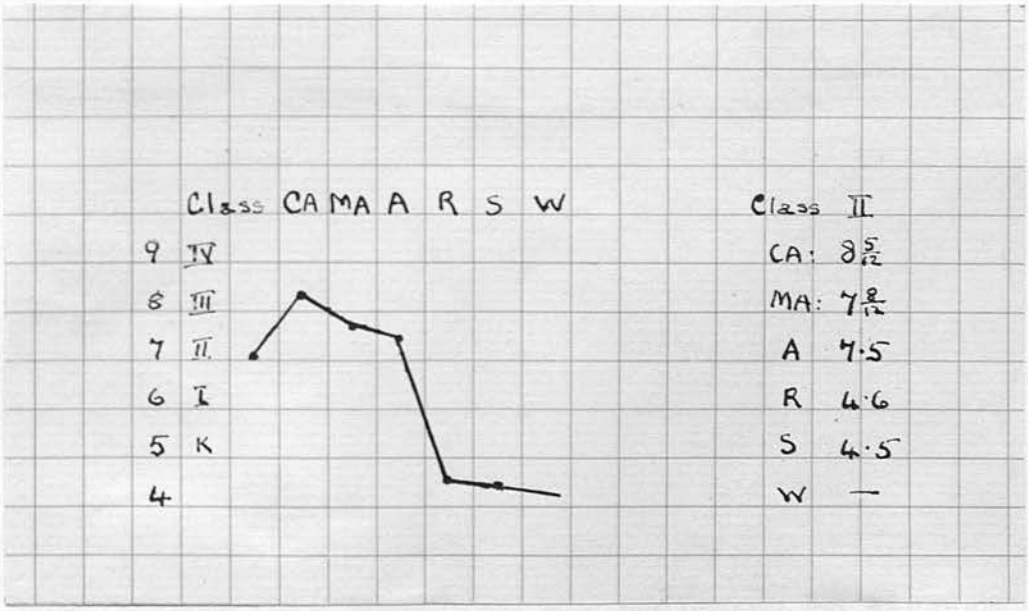
This boy exhibits crossed dominance, with a certain amount of confused dominance: his master eye is strongly left, but hand is R + l, and foot is L + r.

Case V. George H.

Family Tree.



Profile.



CASE VI.

Chris P. Born: 5.3.39. First seen: 27.8.48.

General:

School: preparatory school.

Social Status: Father is a successful K.C. -- good professional environment.

Problem: This boy was referred to the clinic because he had become sulky, withdrawn, and subject to severe outbursts of temper for about two years. His parents were also anxious, as he had "not learned to read".

Clinical Report and History: This boy is the younger child in the family, his sister being three years older, and brilliant intellectually and socially. Chris' early childhood was normal -- he had a few tantrums at about 3, when frustrated, and developed intense jealousy of his sister later. He began school at 5 at a kindergarten, and did quite well. He was noticed to use his left hand a great deal, like his sister, who is persistently left-handed. When due to transfer to a preparatory school, at 6½, he fractured his left arm very severely, and the limb was in plaster for about three months. He started his new school at 7, but appeared quite unable to learn to read. He was subjected to sarcasm and ridicule at school, and pressure at home, and finally became emotionally conditioned against reading. He was transferred to a preparatory boarding school the term before his referral to the clinic.

He was very hostile when first seen, but after succeeding well in his intelligence tests, he thawed considerably. He became very emotional -- making obvious efforts to avoid tears -- when questioned about his reading.

He was in very good physical condition, and vision and hearing were both acute.

At school he was considered to be right-handed, but his parents had noticed that he preferred his left-hand up to the time he broke his arm, when he was beginning to learn to write with his right hand. His earliest school drawing-book showed that he always drew pictures of trains and cars facing towards the right (noted by Blau as occurring in left-handed children).

Family History: Considerable neurosis on the paternal side, and also left-handedness. Christopher's sister is left-handed also. Both grandmothers were twins, second cousins (paternal) are twins, and Chris himself had a twin that died at about the fifth month of gestation.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 117.
Alexander Passalong:	I.Q. 166.
Progressive Matrices:(1938):	Grade II.

Attainment Tests:

Reading Age:	7.5.
Spelling Age:	7.

Attainment Tests, continued:

Writing Age: 7.

Arithmetic Age: 8.5.

See Profile.

Degree of Disability: Reading was two years, and spelling and writing two and a half years retarded. In the tests, both Burt's and Schonell's, reversals, both static and kinetic, were exceedingly frequent -- "on" for "no", "top" for "pot", "bog" for "dog", "apls" and "preas" for "apples" and "pears". His writing was slow and very badly formed -- "a" and "o" confused, reversals, and the wrong number of loops for "m", "n" and "u". His writing had a distinct backward slope.

The disability was greatly aggravated by the extreme feelings of inferiority and resentment. The boy was depressed, and felt hopeless, and certain he would never be able to read.

Clinical Features: This boy was found to be right-eyed, but hand dominance was far from complete. He preferred to play cricket left-handed (batting and bowling) but changed to right-handed playing without trouble. He was very good at hand-work, and far above the average in drawing ability. It seems almost certain that he was a native left-hander, until he broke his left arm, and that his accident converted him forcibly to right-handedness. At his first school he was taught reading by a method combining word-wholes and phonetic methods. He had

begun to learn successfully, and was attempting to read easy books on his own. After his accident he was transferred to a school where the teaching was almost entirely by the flash-card method, and where, in addition, the psychological methods were definitely bad. This combination of conversion of handedness, change of method (to a less satisfactory one, in view of his difficulty), and the subjection to ridicule, resulted in severe aggravation of the disability, and the formation of very severe inferiority feelings.

Clinical Handling and Progress: Chris and his parents were all reassured about his ability. It has been very difficult to control the father's anxiety, and he is still not satisfied with the boy's progress: the boy refuses to read at home, and is still rather withdrawn and sulky there, as he is only too conscious of his father's anxiety. At school (boarding) he is doing much better, and mixes well with the other boys. His reading has improved considerably without any special coaching other than advice to use tracing and pointing methods as much as possible. Reading age is now 9, but spelling is lagging far behind. Writing speed has also improved greatly, but quality remains poor. At the boy's own request, extra tuition in spelling and extra writing practice are being arranged for him at school.

Particular.

Detailed Intelligence Tests: Though very hostile

at the beginning of the tests, he brightened up considerably after a few successes. His reasoning powers and comprehension were very good, in the Stanford-Binet test, but his memory for numbers and sentences was poor. He failed completely in the reading test.

In the Alexander Passalong test he showed great interest and keenness, and did all the subtests quickly and with confidence. He reasoned out his moves carefully, and avoided the trial-and-error method until the last subtest, with which he failed. He gained a high practical ability quotient (166) and was very pleased with his success.

The manipulations in this test were done with both hands equally.

He was also interested in the Progressive Matrices: he did the first test easily and well, but when he came up against the more difficult type of D and E test, he did not persevere, but rushed at them and guessed. He scored at the 75th percentile point for his age.

Tests for Handedness:

Rubs:	R.	Scissors:	uses R. only.
Throws:	L.	Winds:	both hands used, R. in 5 secs. L. in 7 secs. when other hand fixed.
Counters:	R + L. equally.		
		Lines:	R. 42. L. 22.

He writes with his right hand, but the writing is poorly formed, irregular, and often slopes backward.

His left-handed writing was slow, but the formation of the letters was much neater than with the right hand. He failed to do mirror-writing.

This boy is almost certainly a converted sinistral, and even yet has not complete unilateral dominance.

Graded R + L.

Tests for Footedness:

Dominance undetermined: he uses either foot indiscriminately in all tests.

Tests for Eyedness:

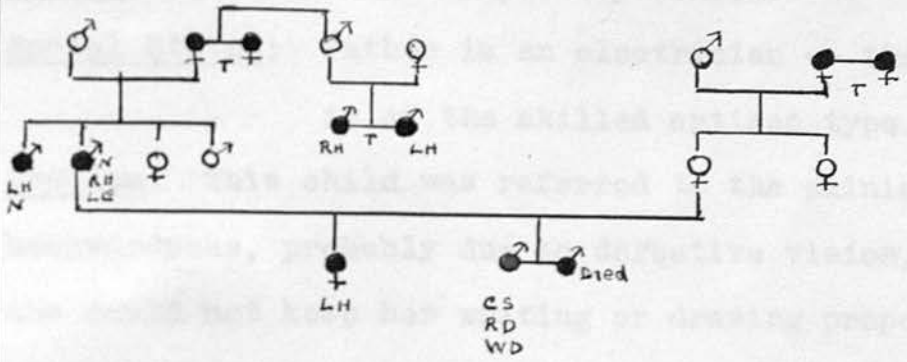
Hole in card:	+10.
Cone:	+8.
Cylinder:	+10.
Toy Telescope:	RH + RE = 5. LH + LE = 5.

Right eye is dominant.

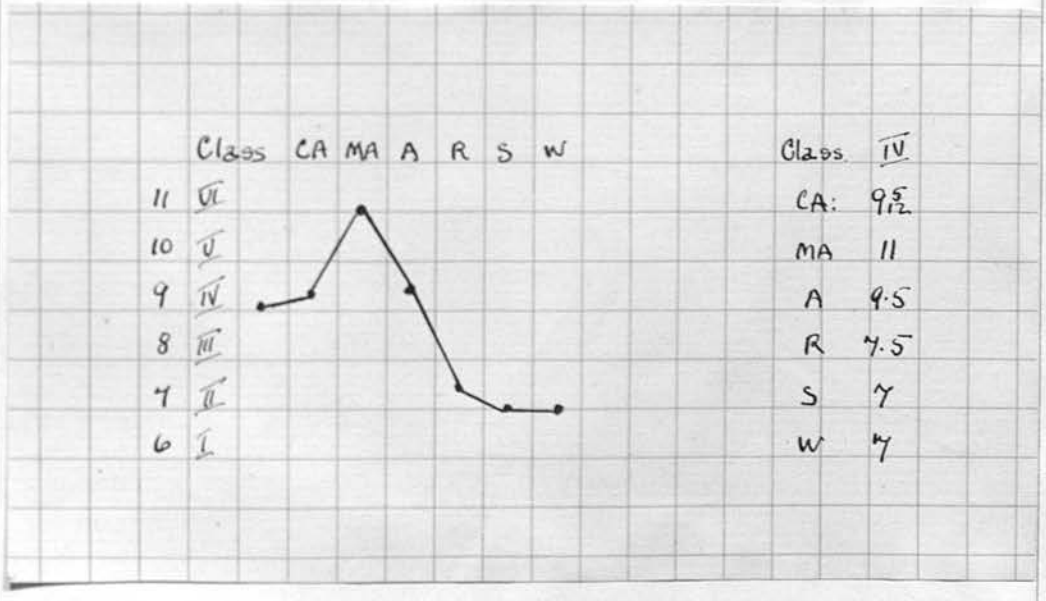
This boy shows mixed dominance but is slowly developing complete dextrality. He is a converted sinistral.

Case VI. Chris P.

Family Tree.



Profile.



CASE VII.

Joan P. Born: 3.3.42. First seen: 28.4.48.

General:

School: local authority primary school.

Social Status: Father is an electrician -- the home is of the skilled artisan type.

Problem: This child was referred to the clinic for backwardness, probably due to defective vision, as she could not keep her writing or drawing properly oriented on the paper.

Clinical Report and History: This child is a twin -- the other twin is livelier, stronger, right-handed, and tends to overshadow Joan who is quieter, more nervous and left-handed. Early development was uneventful: both twins walked at the same time, but Joan was three months later in learning to speak, and at 3, had a much smaller vocabulary than her sister. There were no further difficulties until they started school. Joan lagged behind both educationally and socially. She had great difficulty in learning to write and was a most persistent mirror-writer. In addition, when asked to read from the top left of the board, or book, she invariably began at the bottom right. Efforts to make her use her right hand for writing failed completely. She has not learned to read as well as her twin and has developed very strong inferiority feelings and anxiety.

She is big for her age, and in excellent physical

health. Her vision is normal -- there is no error of refraction -- and her hearing acute. Auditory word discrimination is also acute.

Family History: There is no significant family history, except for the fact that Joan is a twin -- probably an identical twin. Her twin is right-handed, and has exactly the same I.Q.

Intelligence Tests:

Stanford-Binet:	I.Q. 96.
Alexander Passalong:	I.Q.147.
Progressive Matrices (1947):	Grade IV.

Attainment Tests:

Reading Age:	5.
Spelling Age:	5.
Writing Age:	Cannot write.
Arithmetic Age:	6.

See Profile.

Degree of Disability: The disability was most marked in the attempts at writing. She invariably began (spontaneously) at the right side and wrote mirror wise. The letters were extremely badly formed and the lines wandered over the page in all directions. In reading, reversals were very common. Confusion between "b" and "d", "p" and "q" was marked, and words were constantly reversed: "on"to "no", "was" to "saw", "top" to "pot". She could not read well enough to do the whole Schonell test, but almost every word she attempted showed some reversal -- either of letter, or of whole word. Arithmetic was

up to the level of her mental age -- but she made mistakes in writing down figures, transposing (reversing) tens and units. The figure 9 was constantly reversed.

Clinical Features: The very marked defect in orientation was a feature of this case. The child was completely confused between left and right, and top and bottom.

She is strongly left-handed, and right-eyed. She has developed strong inferiority feelings and is withdrawn, over-anxious and introverted. Her twin is right-handed, right-eyed, socially successful and essentially an extravert.

Clinical Handling and Progress: Remedial coaching was instituted intensively. The child was already being taught reading by the phonetic method at school -- this was reinforced by the use of tracing and other kinaesthetic methods. Most stress was placed on the kinaesthetic reinforcement, and all training was given exclusively to the left hand, and all activities, tracing, drawing and pointing were continually emphasized in the left to right direction. After six months coaching, the child was unable to return, for family reasons.

When seen in December, she looked an entirely different child: bright, happy, even a little rowdy. There has been very great improvement at school: she has been promoted at school and is reading almost up to the level of her age. Her arithmetic is up to

standard, and her reading and spelling only very slightly behind. Her writing remains slow and untidy, but is now normal in direction, and her mirror writing has entirely ceased.

Particular.

Detailed Intelligence Tests: She was very upset and tearful when doing the Stanford-Binet test, and cried at intervals. She lacked confidence and needed a great deal of encouragement before she would attempt anything. The behaviour of her twin, tested the same day, was in great contrast -- assured, talkative, and socially very well adjusted. In spite of these differences, the twins had exactly the same I.Q. -- 96.

Rather surprisingly, Joan succeeded in the diamond - drawing test, which her sister failed. The latter passed the similarities test in which Joan failed: otherwise the test results were similar, and showed no scatter.

The Passalong Test was done two months later (Joan only), after the child had become less shy. The result was surprisingly good. After wasting a lot of time trying to force the blocks round, she did extremely well and showed a mental age of 9½. She manipulated the blocks almost entirely with her left-hand.

In the Progressive Matrices (1947) she did badly, only reaching the level of the 15th percentile point. There seems little doubt that her defective visual

orientation and sense of direction affected the result.

Tests for Handedness:

Rubs:	L.	Scissors:	L only.
Throws:	L.	Winds:	L.
Counters:	L.	Lines:	L 16. R 12.

She writes mirror-fashion with both right and left hands, but the script with the latter is much better formed and steadier.

She is dominantly left-handed -- L.

Tests for Footedness:

She hops with either foot, and shows no preference in this activity. In all the other activities she is left-footed.

Tests for Eyedness:

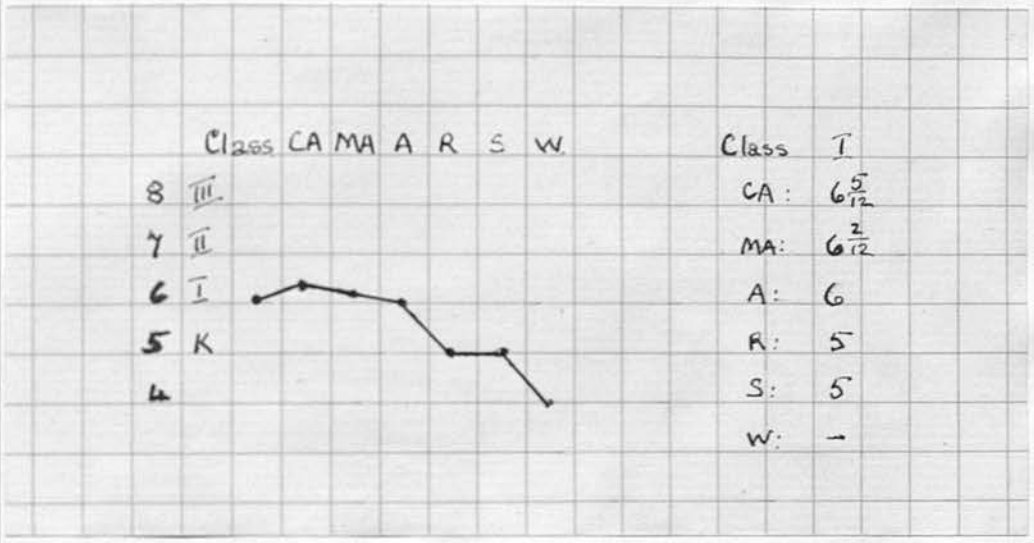
Hole in card:	+10
Cone:	+8
Cylinder:	+10
Toy Telescope:	R eye used in all sub-tests.

Joan shows crossed dominance -- being right-eyed and persistently left-handed.

Her twin with the same intelligence, but right-handed as well as right-eyed, shows no disturbance of any language function.

Case VII. Joan P.

Profile.



CASE VIII.

Roy McC. Born: 1.3.39. First seen: 8.9.48.

General:

School: local authority primary School.

Social Status: Father is a boilermaker, the home surroundings are comfortable, of the artisan type.

Problem: This boy was referred for extreme backwardness at school, nervousness and crying fits.

Clinical Report and History: Roy was a normal baby and had an uneventful childhood until he was 5. He walked at 15 months, and did not speak until he was over 2, and had a slight stammer then, which cleared up some months later. He developed scarlet fever and pneumonia shortly after starting school, and became very nervous after this. He began to fear school, and had severe nightmares. He was very backward, and had not learned to read at the age of nine. Roy is undersized and in poor physical condition: he has enlarged tonsils and adenoids and is a persistent mouthbreather, constantly having colds. His hearing is sometimes impaired when he has a bad cold, but his vision is normal. He sweats profusely -- almost certainly because of his anxiety. He is liable to stammer when very nervous or excited. He is left-handed, but is being made to write with his right hand at school.

Family History: Paternal uncle stammers; maternal grandmother was left-handed; mother was left-handed

and was very slow in learning to read, and hates reading still.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 79.
Alexander Passalong:	I.Q. 73.
Progressive Matrices (1947):	Grade V.

Attainment Tests:

Reading Age:	4.2
Spelling Age:	4.
Writing Age:	-
Arithmetic Age:	6.5.

See Profile.

Degree of Disability: This boy's reading difficulty was much greater than would have been expected from his I.Q. He knew his letters but made many mistakes, usually reversals of "b" and "d", and "p" and "q". With numbers he reversed 9 and 3 frequently, and confused tens and units. He was just able to write his name, but was very apt to begin at the right side of the page, in mirror-script. In both reading and writing, his sense of direction was very poor. He tended to read and write from right to left, and when his attention was drawn to this, he would write his first name at the top left of the page, and his surname at the bottom right.

Clinical Features: This boy, with his low I.Q., falls into the dull and backward group -- but his school failure was far greater than this would warrant. He was found to be mainly left-handed, though hand

dominance was far from strong. He was right-eyed.. Spatial and directional orientation were very poorly developed as a result. His stammer, though slight, was another indication of poor nervous integration. The anxiety state, with crying fits, nightmares, and profuse sweating, was a direct result of fear of school and school failure, which he felt very deeply.

Clinical Handling and Progress: Tonsillectomy was performed, with considerable benefit to his hearing and general health. After this, remedial coaching was begun, with emphasis on oral methods, combined with tracing and pointing. About this time he changed his school, and he was made to write with his right hand. He seemed to be succeeding fairly well, so extra practice with the Marion Richardson patterns was given, and all the pointing and tracing etc. were thereafter carried out with the right hand also. His reading is improving, but very slowly; his reading age is now 5.5. His writing age has risen to 7. The anxiety has diminished, and he no longer has nightmares. The stammer has ceased, and he is beginning to like school.

Particular:

Intelligence Tests in Detail: In the Stanford-Binet test, his memory for numbers and words was very poor. His drawings of square and diamond were very bad. The test showed a large scatter from III6 to 1 test of the VIII year group.

In the Passalong test, he used his left hand for manipulation throughout -- not even using his right

hand to steady the tray, till told to do so. His practical ability was low -- most of the results were obtained by trial-and-error, and he appeared unable to reason out the moves required.

The Progressive Matrices (1938) were too advanced for him, and he did badly with the 1947 variant, only reaching grade V, well below the 5th percentile point. His defective spatial and directional orientation undoubtedly added to his difficulties in this test.

Tests for Handedness:

Rubs:	L.	Scissors:	L.
Throws:	L.	Winds:	Both hands 10 secs. R. 9 secs. L. when other fixed.
Counters:	R + L equally.		
		Lines:	10 L. 9 R.

He writes his name with his right hand, but can write equally well with his left. He can write fluently and easily with his left hand mirror-fashion.

He is mainly left-handed -- L + r.

Tests for Footedness:

In all tests he used his left foot.

Tests for Eyedness:

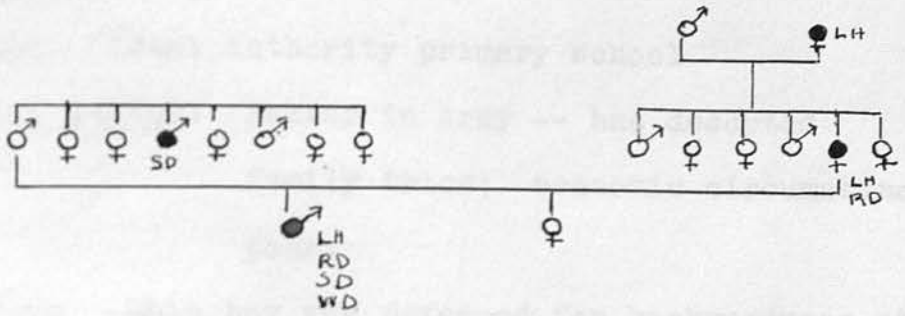
Hole in card:	+10
Cone:	+ 8
Cylinder:	+10
Toy Telescope:	RH + RE = 5 LH + RE = 4 LH + LE = 1

He is predominantly right-eyed -- R.

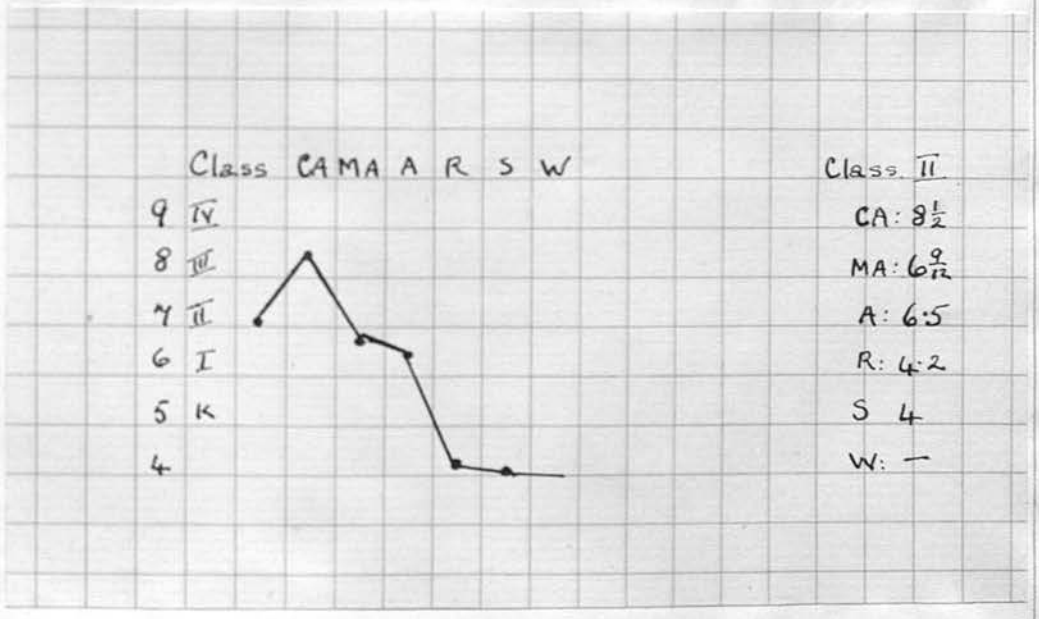
Summary: he shows mixed dominance -- crossing of hand and eye, with dominance of hand incompletely established.

Case VIII. Roy McC.

Family Tree.



Profile.



CASE IX.

Norman D. Born: 25.12.37. First seen: 9.9.48.

General:

School: local authority primary school.

Social Status: Father in Army -- has deserted family twice; economic circumstances poor.

Problem: This boy was referred for backwardness at school. He could neither read nor spell, and was very nervous and emotional, with frequent fits of crying. He was charged at the Juvenile Court with stone throwing, and this has preyed on his mind.

Clinical Report and History: This boy's early development was normal -- and no delay in speaking. When small -- between 2 and 3, he was definitely left-handed, but his mother said proudly, "I soon trained him out of it". There were no temper tantrums or nervous symptoms before starting school. He now uses his right hand for writing, and his left for a good many other activities. He has been unable to learn to read, and is constantly being caned at school for "not knowing his lessons". He likes arithmetic, but cannot do problems, as he cannot read them.

He has been taunted at school about his stupidity, and his"delinquency" and has become very anxious and depressed. He never plays truant, but has frequent attacks of vomiting before starting for school in the mornings. His physical health is good,

and his hearing is normal. He has convergent strabismus for which he wears glasses.

Family History: Father is left-handed, and has always been a poor reader -- he is an unstable psychopath and has deserted the family at least twice. The mother and one maternal aunt had convergent strabismus.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 99.
Alexander Passalong:	I.Q. 111.
Progressive Matrices: (1938):	Grade IV-.

Attainment Tests:

Reading Age:	4.8.
Spelling Age:	6.
Writing Age:	6.
Arithmetic Age:	8.4.

See Profile.

Degree of Disability: Reading was very poor -- all words were spelt out aloud. Marked confusion between "b" and "d", "p" and "q", "n" and "u". Also kinetic reversals of "on" for "no", "was" for "saw", etc. He had no idea of blending letters to make words, and could not read word-wholes. Writing was better than reading, but was slow and irregular, and usually had a backward slope. Oral spelling was also better than reading, but written spelling was poor with typical reversals and omissions.

Clinical Features: This boy's vision had been

blamed for his reading difficulty, but the refractive error was small, and was completely corrected by glasses -- and the strabismus also improved greatly. Auditory word discrimination was good.

His handedness was indeterminate, he had been forcibly converted to dextrality, and wrote right-handed, but not well. In other activities and in games, he tended to use his left hand more. The anxiety was very largely the result of the very harsh treatment at school, but the "broken home" and the father's instability were also significant factors.

Clinical Handling and Progress: Remedial coaching was begun at once: phonic and tracing (kinaesthetic) methods were used, and every endeavour made to fix the right hand.

After five months' coaching, noticeable improvement took place: but unfortunately the home was finally broken up, and the boy went to his maternal grandmother in the country. There, in the easier atmosphere of a country school, he is succeeding in holding his own.

Particular:

Intelligence Tests in Detail:

In the Stanford-Binet he had an I.Q. of 99 -- his verbal memory was poor, and he failed in the reading test and in the designs.

In the Passalong test he was quick and accurate, and showed considerable practical ability. He used his left hand exclusively for the manipulations, but

when he was asked if he was left-handed, he denied it hotly.

In the Progressive Matrices (1938) his results were poor, only reaching the 10th percentile point for his age. Here also the results seemed to be affected by his defective spatial and directional visual orientation.

Tests for Handedness:

Rubs:	lifted with L, rubbed with R.	Scissors:	R.
Throws:	R.	Winds:	L.
Counters:	R + L.	Lines:	R 22. L 26.

He writes with his right hand normally, but shows considerable facility with his left. He failed in the mirror writing test.

He shows incomplete hand dominance, and is almost certainly a sinistral becoming converted-R + L.

Tests for Footedness:

His left foot is dominant in all tests.

Tests for Eyedness:

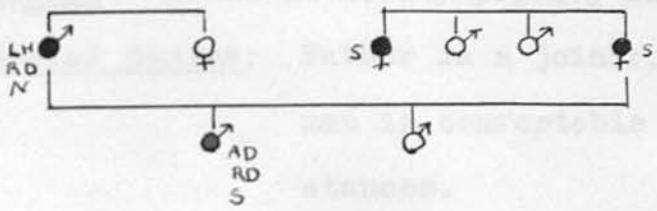
Hole in card:	+ 8.
Cone:	+ 6.
Cylinder:	+10.
Toy Telescope:	RH + RE = 5 LH + RE = 3 LH + LE = 2

He is right-eyed R .

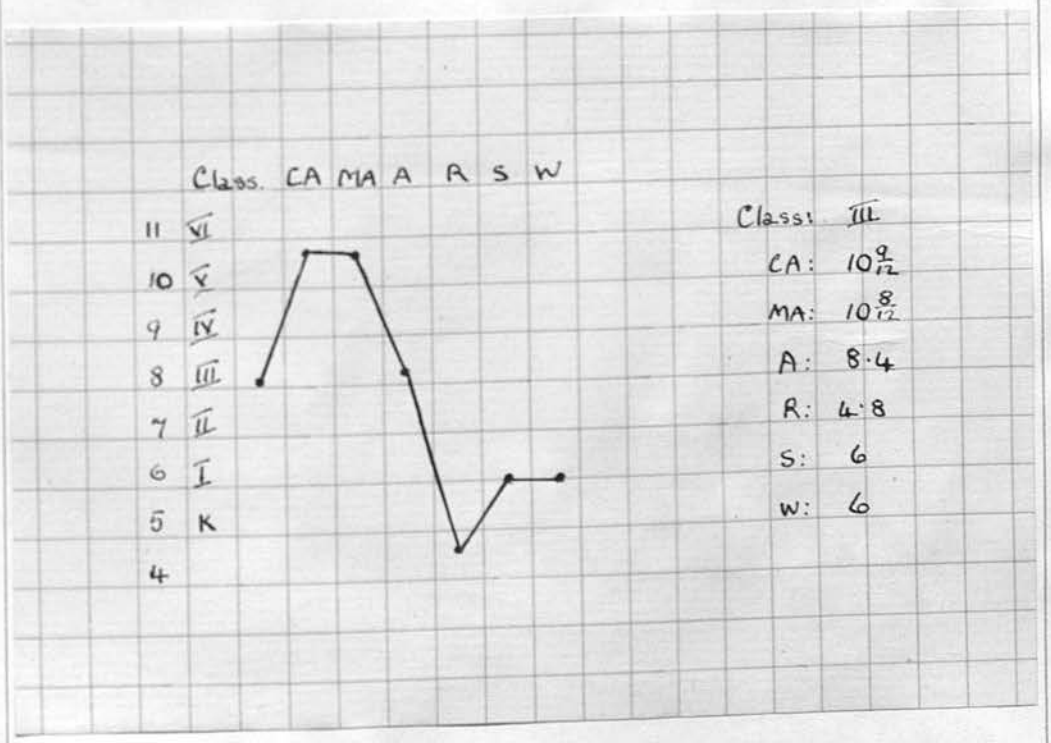
He shows mixed dominance, but the hand dominance is as yet incomplete

Case IX. Norman D.

Family Tree.



Profile.



CASE X.

Norman G. Born: 2.8.39. First seen: 14.9.48.

General:

School: local authority primary school.

Social Status: Father is a joiner, a skilled craftsman in comfortable economic circumstances.

Problem: This boy was referred to the clinic for habit spasms: blinking of eyes, grimacing, and shrugging of shoulders. These movements were very noticeable at school, where he was said to be very backward.

Clinical Report and History: This boy's early development was normal, except for speech which did not begin till he was over 2. He was subject to frequent colds and bronchitis, and had his tonsils and adenoids removed before he began school at 5. He liked school at first, but dislike developed before he had attended for a year. He had a severe attack of croup at 6, and on his return to school after this, the tics developed, and have slowly become worse.

His general physical condition is fairly good, but he is pale, and subject to colds. His hearing is good. He has slight myopia, for which glasses have been prescribed, but he refuses to wear them. He is a very slow reader and a bad speller, and resists his parents' efforts to teach him. He blinks his eyes continually, and shrugs his shoulders whenever he is

spoken to. He is withdrawn, very shy, and rather hostile.

Family History: Father was always slow at school, especially at reading. Maternal aunt is left-handed; mother is ambidextrous and had speech delay (till she was $3\frac{1}{2}$) and has a severe lisp.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 97.
Alexander Passalong:	I.Q. 120.
Progressive Matrices (1938):	Grade III-.

Attainment Tests:

Reading Age:	7.
Spelling Age:	5.5.
Writing Age:	8.
Arithmetic Age:	8.6.

See Profile.

Degree of Disability: Spelling was extremely bad, both oral and written. In written dictation he showed many reversals, both static and kinetic. Reading was very slow -- he spelt out words orally, letter by letter, and made many errors of the reversal type, but usually corrected these spontaneously. This delayed his reading considerably, and reading was obviously a heavy task. Auditory word discrimination was good, but on Schonell's directional test, he had fifteen reversal errors.

Clinical Features: The tics arose from the undue pressure at home and school, especially the latter.

The shrugging of his shoulders indicated a "don't care" attitude, but he felt his inferiority very deeply and became withdrawn and hostile. On investigation he was found to be strongly left-eyed, and mainly right-handed.

Clinical Handling and Progress: Remedial coaching was arranged: the superficial cause of the disability was explained to the boy and his parents, and the latter were reassured about his intelligence, and advised to cease pressing him.

When being coached, he received the usual training -- phonetic and tracing methods, with directional pointing -- attempts being made to fix the use of his right hand.

By December 1949, the tics had entirely ceased and on rare occasions, the boy actually smiled. He did better at school, and was promoted to 3rd class. Reading age improved to 9.4, and his spelling age jumped from 5.5 to 9.

His mother reported that he had become much more sociable, and that he had joined the Life Boys. He has begun to read for pleasure.

Particular.

Detailed Intelligence Tests: In the Stanford-Binet, although he obtained an I.Q. of 97, showing average ability, his responses were very slow and hesitant, and he showed very poor verbal ability. His memory for number was good, and also comprehension and reasoning.

In the Passalong test he did much better -- his expression changed and he showed some interest. He did the test well and quickly, without much trial-and-error. He has a high practical ability. Throughout this test, he used his left hand to steady and his right hand for manipulation.

In the Matrices, he did not score so well -- the visual form of the test seemed to confuse him. He was in Grade III-, at about the 30th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R only.
Throws:	R.	Winds:	R.
Counters:	R.	Lines:	R 30. L 20.

He writes with his right hand, and has no left hand facility. He can neither read nor write mirror-fashion.

He is predominantly R. handed.

Tests for Footedness:

He used his right foot consistently in every test, and is predominantly right-footed.

Tests for Eyedness:

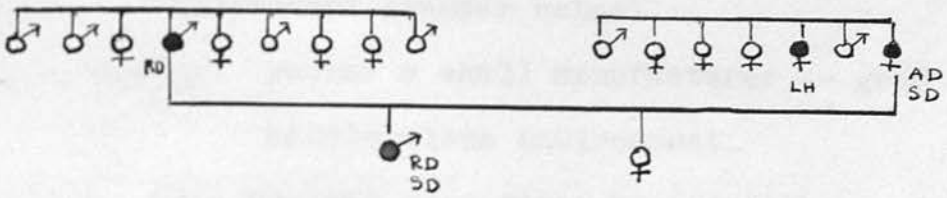
Hole in card:	-10.
Cone:	-10.
Cylinder:	-10.
Toy Telescope:	LH + LE = 5 RH + LE = 3 RH + RE = 2

He is persistently left-eyed.

This boy having dominant right hand and left eye, shows crossed dominance.

Case X. Norman G.

Family Tree.



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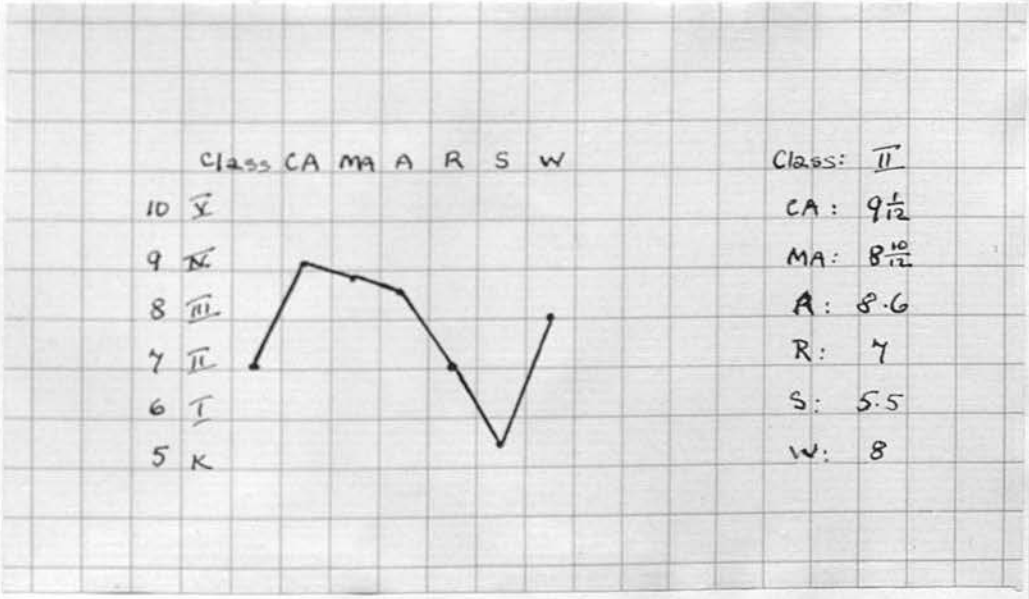


CASE XI.

Alan E. Born: 28.3.37. First seen: 10.1.49.

General:

School: independent grammar school.

Social Status: father a small manufacturer -- good middle class environment.

Problem: This boy was seen first by a speech therapist in 1945, for severe stammer. Treatment lapsed, and the stammer got much worse, with severe accessory movements, after he was promoted to the senior school.

Clinical Report and History: Alan began to stammer when he first began to speak, at 16 months. His stammer has been present in varying degrees ever since. He was always advanced for his age, and learned to read easily and early. When he was 8, his eyes were tested and he was found to have a very severe degree of myopia.

He has always been left-handed, and uses his left hand for writing -- but recently has tried to play cricket and golf right-handed, "to be like the others!" He is shy, and finds if difficult to make friends -- he was afraid to change from the Cubs to the Scouts, and from the preparatory to the senior school, and at these times his speech got worse. He is doing very well at school, but gets low marks for reading on account of his stammer.

Family History: Two paternal uncles were left-handed; father is ambidextrous; mother has acute anxiety

attacks.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 151.
Alexander Passalong:	I.Q. 109.
Progressive Matrices (1938):	Grade II+.

Degree of Disability and Clinical Features:

The stammer has been present since speech began at 16 months. About six months ago, when transfer to the senior school was being discussed, his stammer became so bad that he was almost mute, and accessory movements affected his whole body.

He taught himself to read before he began school, but his mother noticed that he continued to confuse letters and reverse words for two years after this. She had also noticed a marked tendency to transpose or reverse syllables (in speech) between the ages of 2 and 3.

He is strongly left-handed and right-eyed.

Clinical Handling and Progress: Routine speech therapy, with breathing exercises, and much stress on relaxation, has continued. This has been combined with painting and writing patterns on a large scale. These have helped to produce relaxation, and confirm- his left-hand training; he has been advised to keep to the left hand for games too.

He is now (December 1949) stammering much less, and is more self confident. He is able to read in class, and the accessory movements have disappeared. He is

now well adjusted socially.

Particular:

Detailed Intelligence Tests:

He did the Stanford-Binet tests with ease -- self-confidently, and unembarrassed by stammer. His memory was excellent, comprehension and reasoning far above the average. Definitions were lucid, and his memory for numbers exceptional. His I.Q. of 151 shows his very superior intelligence.

In the Passalong test, he was not so exceptional, but still above the average. He was slow, and planned his moves carefully, but lost marks for the time taken. He did all the manipulations with his left hand.

In the Progressive Matrices he did well also, but appeared to have some visual difficulties in the finer details of the more advanced tests. In spite of this, he reached the 90th percentile point on the scale.

Tests for Handedness:

Rubs:	L.	Scissors: could only use	R.
Throws:	L.	Winds:	L.
Counters:	L.	Lines:	26 L. 20 R.

He writes rapidly and neatly, with his left hand -- the writing has a backward slant. His attempt to write with his right hand was very poor. He could not do mirror writing. At school he played cricket right-handed (school training) and also golf (no left-handed clubs) but he has now changed to his

left hand for all activities.

His left hand is strongly dominant.

Tests for Footedness:

In every test he used his left foot, and is predominantly left-footed.

He is however, practising right-footed kicking for football.

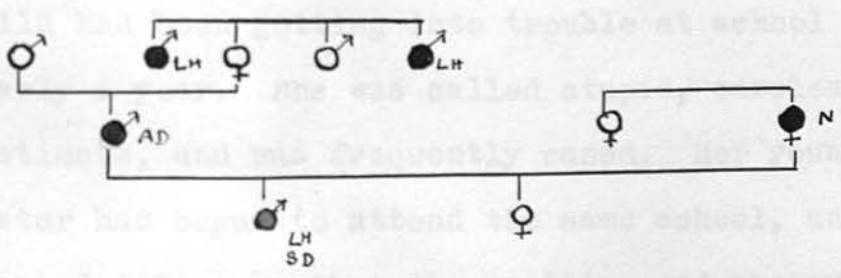
Tests for Eyedness:

Hole in card:	+2 .
Cone:	+6 .
Cylinder:	+10.
Toy Telescope:	RH + RE = 5. LH + RE = 3. LH + LE = 2.

Right eye is Dominant.

He therefore shows marked crossed dominance.

Family Tree:



CASE XII.

Josephine C. Born: 2.3.40. First seen: 31.1.49.

General:

School: local authority primary school.

Social Status: Father is a fitter: economic circumstances are good, but family is about to emigrate to Canada.

Problem: Josephine was referred for stealing which had been going on for several months.

Clinical Report and History: This child had been stealing money from relatives and using it to buy ice-cream for school friends, and to take them to the cinema. She had been found out, and beaten severely, but continued to steal.

Her early development was normal, and she walked and spoke at normal times. She was however, apt to cry at night, and exasperated her mother, who quite obviously rejected her as she had wanted a boy. She has had frequent temper tantrums from the time she was 3.

On further investigation, it was found that this child had been getting into trouble at school for nearly a year. She was called stupid, careless, and obstinate, and was frequently caned. Her younger sister had begun to attend the same school, and she carried tales, so that the scolding and pressure continued at home.

Josephine was able to read, but in both reading and spelling, made very many mistakes. These were put down to carelessness, and bad work, and she was punished. She made mistakes in arithmetic too --

and the more she was punished, the more she stole.
She was found to be right-handed, but left-eyed, with convergent strabismus and a slight error of refraction, corrected by glasses.
She was in good physical health, and her hearing was normal -- and she was musical.

Family History: Paternal grandfather was ambidextrous -- and he wrote and held a hammer with either hand; father and paternal uncle left-handed; mother has convergent strabismus; maternal aunt epileptic.
See Family Tree.

Intelligence Tests:

Stanford Binet:	I.Q. 115.
Alexander Passalong:	I.Q. 106.
Progressive Matrices (1947):	Grade III.

Attainment Tests:

Reading Age:	7.6.
Spelling Age:	7.8.
Writing Age:	7.8.
Arithmetic Age:	8.

See Profile.

Degree of Disability: Her educational attainments were over two years behind her mental age. The mistakes which lowered her results in the verbal tests were almost entirely static and kinetic reversals. In arithmetic also, her work was accurate, except for confusions in writing down tens and units. When her school books were examined, it became obvious that all her "careless" work was due to the frequency of these errors.

She was able, by extreme concentration and slowing down of rate of work, to correct these mistakes -- but usually had not time.

Clinical Features: The delinquency was a direct result of the rejection at home and the harsh treatment at school. The arrival of the favourite, tale-bearing sister at school, precipitated the crisis. The child felt unwanted, stupid, and hopeless, and attempted to buy the esteem of her school-fellows.

Clinical Handling and Progress: The child's difficulties were explained to the school teacher, who endeavoured, with some success, to be more sympathetic. Remedial coaching was begun at the clinic, and for three months was carried out intensively -- tracing and directional training was combined with phonetic blending of sounds, etc. The parents were advised to use more praise and encouragement. The family sailed for Canada five months after the child was first seen. There had been no more pilfering, Josephine seemed happier, and was doing better at school. Her reading age had jumped to 8.8, and though slow in her work, she was much more accurate.

Particular:

Intelligence Tests in Detail:

In the Stanford-Binet she was keenly interested and tried hard. Her memory and comprehension were very good, but her visual imagery was poor -- she failed completely with the designs and paper cutting -- and

with the similarities. She showed a great deal of scatter, from VI to XIII.

In the Passalong test, she was very quick in the successful tests -- but only succeeded in four. She manipulated the blocks with her right hand.

In the Matrices, her score placed her at the 50th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	R.	Lines:	R. 26. L. 15.

She writes with her right hand, and cannot write with her left -- she showed slight facility in mirror-writing with her left hand.

She is predominantly right-handed.

Tests for Footedness:

She is predominantly right-footed, and used this foot in all tests.

Tests for Eyedness:

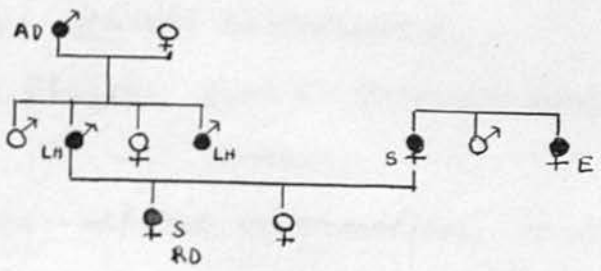
Hole in card:	-8.
Cone:	-8.
Cylinder:	-10.
Toy Telescope:	RH + RE = 2 RH + LE = 3 LH + LE = 5

She is strongly left-eyed.

She thus shows crossed dominance.

Case XII. Josephine C.

Family Tree.



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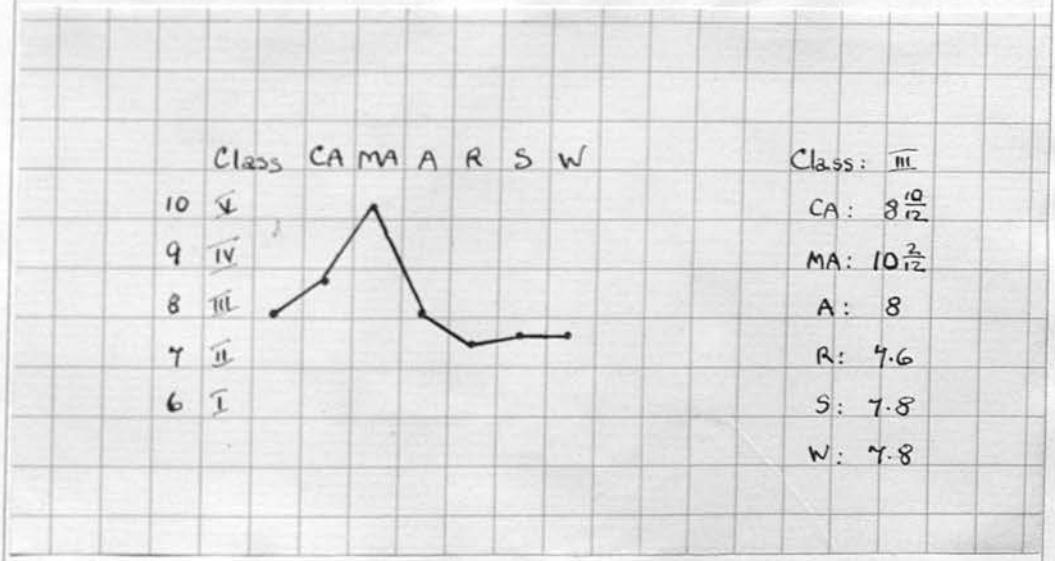


CASE XIII.

John A. Born: 5.3.42. First seen: 3.2.49.

General.

School: private kindergarten.

Social Status: good -- father a senior Civil Servant.

Problem: Extreme restlessness; inability to concentrate; incessant chatter; unable to learn to read or write.

Clinical Report and History: John was a much wanted child, but his mother was very ill before and after his birth. Labour was extremely difficult -- high forceps delivery -- and the baby was badly mutilated, and there was probably some birth injury. There are still visible scars on both parietal regions.

Development was slow -- he did not sit up till he was 10 months -- but he began to talk then. He did not walk till he was 18 months. He has suffered from acidosis and night terrors since he was $3\frac{1}{2}$. He is very clumsy, constantly falling and bruising or cutting himself, and was very slow to feed or dress himself. His mother is often "fed up" with him.

He started school at $5\frac{1}{2}$, and was terrified of other children. He was often absent with colds, earache, or acidosis.

At school he was very restless and talkative. He had a large vocabulary, but could neither read nor write. All his movements are uncontrolled and exaggerated; he shouts loudly instead of speaking; when he laughs, his whole body is convulsed and there

is a tendency to enuresis; at games or drill, all his actions are wild and clumsy. Until he went to school, he was noticed to be largely ambidextrous, with a slight preference for the left hand. He never consented to hold a pencil or scribble or draw before going to school.

Family History: There is a significant history of left-handedness on both sides: maternal grandfather deals cards left-handed; mother ambidextrous, left-eyed, and had reading difficulty; maternal aunt left-handed; father was very slow in speaking ($3\frac{1}{2}$) and paternal aunt is left-handed. John's younger brother is slow in speaking ($3\frac{1}{2}$) and has a stammer and a lisp.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 115.
Alexander Passalong:	I.Q. 123.
Progressive Matrices (1947):	Grade IV-.

Attainment Tests:

Reading Age:	4.5.
Spelling Age:	4.5.
Writing Age:	-
Arithmetic Age:	6.

See Profile.

Degree of Disability: Reading is very poor in view of his I.Q. and superior vocabulary. He spells out words letter by letter -- frequently confusing "b" and

"d", and reverses syllables, "on" for "no"etc. Spelling was also bad, but writing was the most affected function: the writing straggled in all directions -- there were frequent reversals of letters -- he seemed quite unable to perceive the relationship of one letter to another, and quite unable to keep his letters between the lines of his copybook.

Clinical Features: The most noticeable feature about this boy is his extreme awkwardness and clumsiness. In view of the history of birth injury, some degree of spastic paralysis was suspected, but a full neurological examination elicited no sign whatever of any organic lesion. The clumsiness appears to be the developmental apraxia described by Orton.

He refuses to draw -- his movements are so clumsy. He only learned to dress himself completely at the age of 6. He is constantly falling or bumping into things. The clumsiness affects almost all activities, and yet has responded to (self-) training: the boy is a very keen fisherman, and is able to manage a rod and reel, to tie on his own hooks, and to bait them, with great success, for one so young!

He is very much above the average in comprehension of language, has a vivid imagination, and loves telling stories and making up rhymes. He was therefore greatly frustrated and felt very inferior when he failed to achieve as much as other -- duller -- pupils. His behaviour became very aggressive, in compensation, and there were frequent fights.

There is also considerable parental anxiety at home, which has increased the emotional instability of the boy, who has always shown some negativistic tendencies.

Clinical Handling and Progress: The extreme restlessness and aggressiveness made coaching difficult, so play therapy, with a small group, was carried out for several weeks. The boastful aggressiveness slowly diminished, and coaching then began. Painting and writing patterns of the Marion Richardson type were used, and the right hand was trained exclusively. There has been considerable resistance to the practice required, but constant praise and encouragement are beginning to have a good effect. Reading has improved, so that his reading age is now 6.4, and oral spelling has also improved to this level. The writing disability, and the clumsiness, are much greater than the reading disability which has responded well to the usual coaching methods.

It has now been arranged for him to have daily coaching at home, instead of bi-weekly visits to the clinic which have proved insufficient. His general behaviour and emotional instability have greatly improved.

Particular.

Detailed Intelligence Tests:

During the Stanford-Binet test, after an initial emotional outburst, he talked without ceasing -- usually in a boastful and aggressive manner. He did not concentrate, and gave the impression of deliber-

ately not trying. He disliked using a pencil, and failed badly in the tests involving drawing -- the diamond, designs and paper cutting. Nevertheless with his good vocabulary and comprehension, his I.Q. was 115.

In the Passalong test his result (I.Q. 123) was surprisingly good in view of his general clumsiness and apparent lack of practicality. He manipulated the blocks with both hands. In contrast to the above, his showing in the Progressive Matrices was surprisingly poor, and this appeared to bear some relation to his defective sense of visual orientation and direction that is so obvious in his writing. He only reached grade IV-, at the 10th percentile point. His auditory word discrimination was excellent in Monroe's test.

In Schonell's test of directional attack, he was unable to read many of the words: but 50% of the words he attempted showed a single letter reversed, or the whole word, "dig" for "big"; "for" for "of"; "on" for "no"; "god" for "dog"; "tar" for "rat"; "war" for "raw".

Tests for Handedness:

Rubs:	L.	Scissors:	R.
Throws:	L.	Winds:	both: when one fixed, 9 secs. R. 8 secs. L.
Counters:	both equally.		
		Lines:	24 R. 23 L.

He writes his name (the only writing he can do with

any success) with his right hand, and can also write almost as well with his left hand. In both tests he omitted the letter n from John. He writes much more neatly mirror-wise, with both hands -- and spelt his namely correctly when he wrote this way.

He plays cricket right- or left-handed, golf left-handed (both very badly) but uses his fishing-rod successfully with either hand. This boy is essentially ambilateral -- without dominance of either hand. There seems to be a very slight bias to the left -- L + R.

Tests for Footedness:

He is predominantly left-footed in all the tests.

Tests for Eyedness:

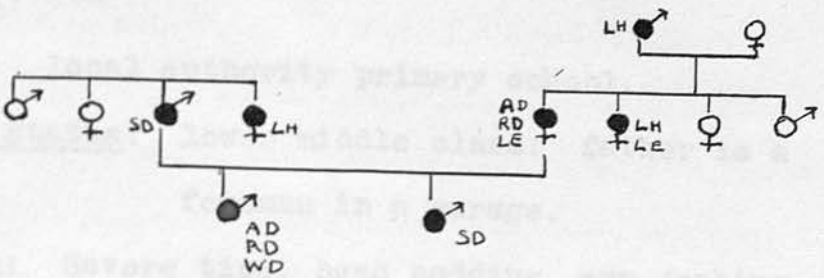
Hole in card:	+10.
Cone:	+8.
Cylinder:	+10.
Toy Telescope:	RH + RE = 5. LH + LE = 4. LH + RE = 1.

He is definitely Right-eyed.

Dominance is incompletely established here -- R eye and L + R hand -- and there is a slight tendency to mixing also.

Case XIII. John A.

Family Tree.



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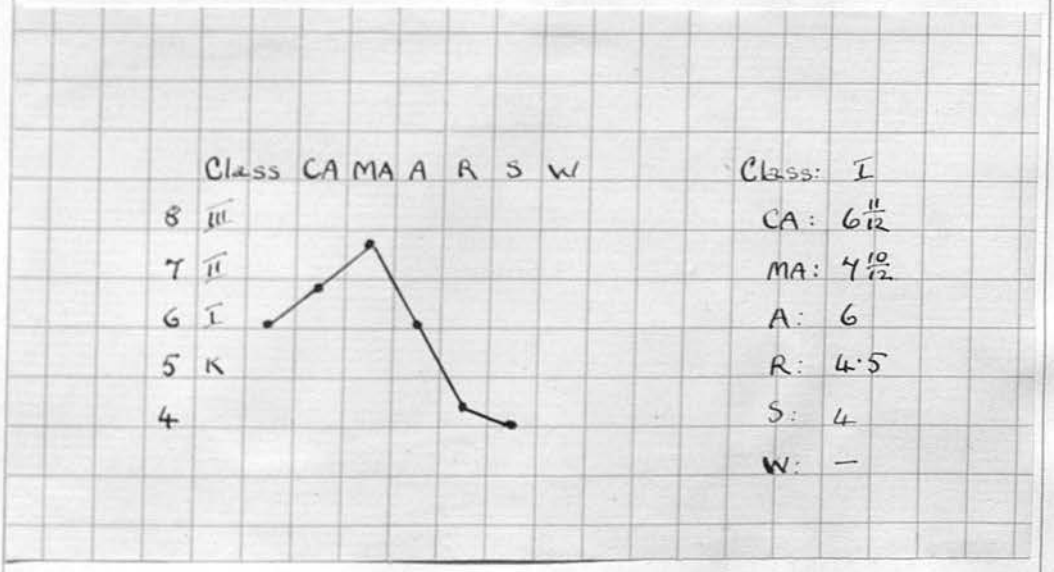


CASE XIV.

Raymond W. Born: 1.10.42. First seen: 7.2.49.

General:

School: local authority primary school.

Social Status: lower middle class: father is a foreman in a garage.

Problem: Severe tics, head nodding, arm jerking, blinking, shortly after beginning school. Behaviour at school hyperactive and uncontrollable.

Clinical Report and History: This boy -- an only child, had normal early development. He walked at a year, and "talked" at thirteen months. His "talk" however, indicated that he could say "dada". He said no other words until he was 2½, when speech really began. He has a very severe defect of articulation involving especially S, R, Th, though at times all the consonants appear to be distorted and his speech becomes almost unintelligible. There is no stammer. There was no difficulty in training, or in behaviour until he began school, although he was asocial and overdependent on his mother because of the speech defect.

School began in December 1947, and by May 1948, the tics were well marked. He was moved up a class in August, but the tics increased to such an extent that he was kept off school until December 1948 and then started at another school. After each period of rest, the tics disappeared, but recurred when he returned to school. His behaviour deteriorated, he

became restless, aggressive and noisy -- sleep was disturbed -- and he began to spit at people -- he then became enuretic, especially at school.

He is in good physical condition -- and no abnormalities were found. His hearing is good, and tests with the pure-tone audiometer showed no hearing loss. His vision is also normal, though he has a tendency to recurrent attacks of conjunctivitis.

Family History: Raymond's mother is ambidextrous and believes she was left-handed as a child before going to school; she is also nervous and highly strung. Her elder brother has a slight convergent strabismus. Raymond's father is moody and irritable -- is a mild depressive.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 111.
Alexander Passalong:	I.Q. 128.
Progressive Matrices (1947):	Grade III+.

Attainment Tests:

Reading Age:	4.8.
Spelling Age:	5.
Writing Age:	below 6.
Arithmetic Age:	6.5.

See Profile.

Degree of Disability: The speech defect is the most marked disability, but reading and writing are also slightly affected, although the retardation here may be due in part to his absences from school.

His speech is thick and indistinct; there is blurring of all the consonants, with marked distortion of R, S, and Th. He was sensitive about his speech and disliked speaking to strangers or at school.
His reading showed many static and kinetic reversals. His writing was very slow and of poor quality -- he was beginning to write with his left hand.
Clinical Features: Raymond's speech defect kept him from associating freely with other children; he was much too dependent on his mother, whose excessive anxiety was soon communicated to him.
He has been persistently left-handed since he was 10 months old, and all efforts to retrain have failed. At his first school, strenuous efforts -- involving considerable pressure -- were made to teach him to write with his right hand, but these failed. At his second school he was allowed to write left-handed, and has shown some slight improvement. He was good at arithmetic, so his reading mistakes were put down to laziness and carelessness, and he was constantly being punished: this unsympathetic handling and the feelings of inferiority arising from his disabilities, produced the tics and the behaviour disturbance.
Clinical Handling and Progress: The boy's school was visited and he was put in charge of a more sympathetic teacher: he was allowed to continue left-hand writing and all pressure was stopped. He was found to be right-eyed, and was therefore encouraged to trace and point with his left index finger when reading,

and his teacher, who became more interested in the problem, undertook to give him extra practice in "tracing and saying" letters. Speech therapy, with special exercises and training to overcome the articulatory defects was carried out intensively.
The mother was reassured about the boy's innate ability, and became less anxious: she allowed him to become much more independent.
In addition, the boy attended a play group and after an initial phase of uninhibited and aggressive behaviour, soon settled down into a more normal, well adjusted child. When seen in December, 1949, his speech was much more distinct and fluent; though he still had difficulty with the letter S; his reading age had risen to 6.5, and writing reached the same level. The tics and behaviour problem had entirely cleared up.

Particular:

Detailed Intelligence Tests:

He was extremely restless and fidgety while doing the Stanford-Binet test. He hummed and muttered under his breath, and showed marked distractibility of attention. He passed all the tests at the VI year level, failed in the diamond drawing at VII, and passed the verbal absurdities at VIII.
In the Alexander Passalong test, he was very clumsy in his movements, but was quick in reasoning out the moves. He used his left hand exclusively for manipulating the blocks. He showed considerable practical

ability, gaining an I.Q. of 128.

In the Progressive Matrices (1947), he was too quick, and lacked concentration. In the more difficult tests, he simply chose the first symbol that resembled any part of the pattern. His score was at the level of the 60th percentile point for his age.

Tests for Handedness:

Rubs:	L.	Scissors:	L.
Throws:	L.	Winds:	L.
Counters:	L more than R.	Lines:	L 18. R 18. but R ones faint and irregular.

Left-handed writing of name is reasonably legible: right-handed writing quite illegible. Mirror writing with left hand very good.

He is persistently left-handed.

Tests for Footedness:

He hops on his right foot, but all other tests show him to be predominantly left-footed.

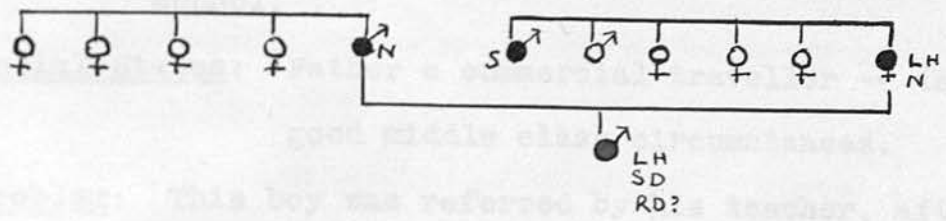
Tests for Eyedness:

Hole in card:	+10.
Cone:	+6.
Cylinder:	+10.
Toy Telescope:	RH + RE = 5. LH + RE = 3. LH + LE = 2.

He is strongly Right-eyed.

This is a case of marked crossed dominance.

Case.XIV. Raymond W.



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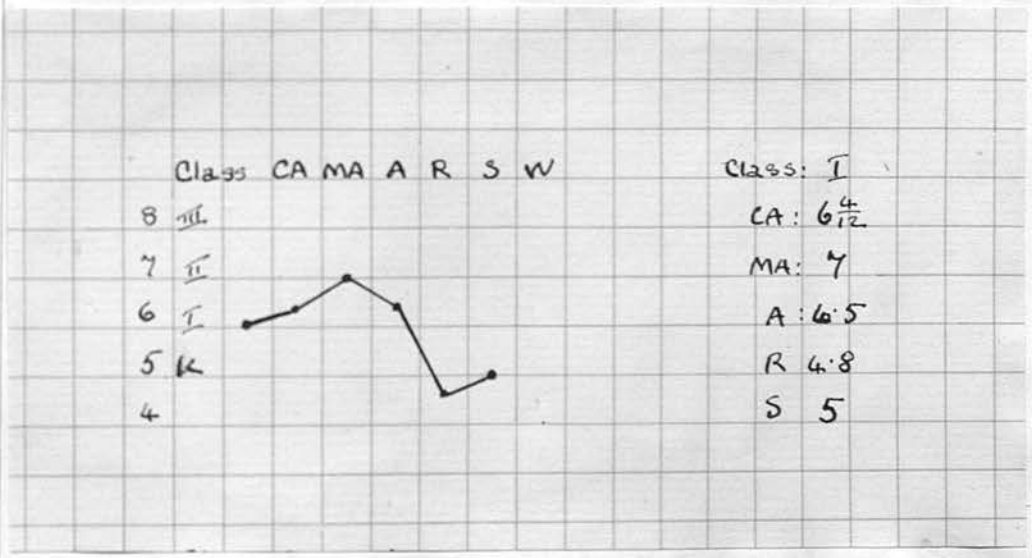


CASE XV.

John H. Born: 24.2.43. First seen: 2.3.49.

General:

School: kindergarten department of independent school.

Social Status: Father a commercial traveller -- in good middle class circumstances.

Problem: This boy was referred by his teacher, after he had been at school for six months: for severe speech defect, inability to learn, and bouts of vomiting on reaching school.

Clinical Report and History: This child was very slow in learning to speak,(aged $3\frac{1}{2}$,)and his speech has always been distorted and unintelligible, except to his immediate family. He has great difficulty with the sounds L, S, R, and Th, and in addition, a severe stammer. His hearing is acute, and his word discrimination test showed no defect. A test with the pure-tone audiometer showed no hearing loss. Apart from the speech delay and defect, his early development was uneventful, but his defect prevented his mixing with other children and he was overdependent on his mother. When he started school, he was sick every morning during his first term. After one term at school he shows no sign of being able to learn to read or write, although he is doing well at arithmetic. His teacher is exceptionally well qualified and advised his parents to seek advice without delay.

His general physical condition is very good, but he has developed a slight kyphosis, essentially functional, and due to his "hang-dog" attitude.

Family History: There is considerable "nervousness" on the father's side and a history of left-handedness; father was very slow in speaking and had a speech defect till he was 11 (articulatory); paternal aunt and grandmother were strongly left-handed; father and uncle ambidextrous.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 103.
Alexander Passalong:	I.Q. 132.
Progressive Matrices (1947):	Grade III-.

Attainment Tests:

Reading Age:	-
Spelling Age:	-
Writing Age:	-
Arithmetic Age:	5.5.

See Profile.

Degree of Disability: Speech is unintelligible to most people -- his teacher is just beginning to understand him. He shows very severe dyslalia: with a marked stammer.

At school he is quite unable to learn to read by the "look and say" method, and his visual perception and memory (of direction of words) is exceedingly poor. He confuses all the similar letters, in particular reversing "b", "d", and "p". In writing, he uses his

left hand, and invariably writes mirror wise, or upside down.

Clinical Features: This boy's extreme difficulty in communicating with others has set him apart, and he could not mix with other children properly. When forced into the wider world of school, he reacted by having frequent attacks of vomiting. He was under severe nervous strain all the time he was at school -- and away from his mother -- and feelings of inferiority were increased by his inability to learn. He was found to be very markedly left-handed, and right-eyed.

Clinical Handling and Progress: Routine speech therapy was begun at once, concentrating on retraining for the defects of articulation, although breathing exercises and relaxation were combined, to diminish the stammer. The painting and tracing of patterns in the left to right direction using the Marion Richardson methods was encouraged, and he was made to use his left hand only. The look-and -say method of teaching reading was dropped, and he was taught largely by phonic methods, and encouraged to trace with his finger, sound, and name every letter, and later, to point with his finger along the line as he read, to fix the left-to-right direction.

After nine months special training, his stammer has disappeared. His speech has improved steadily, and although still blurred and thick, is much more distinct and quite intelligible.

His reading age is now 5.3 -- he is still making the

characteristic static and kinetic reversals, but improvement is really marked. He is now able to write his name, and also a few easy words. His writing speed is 20, and the quality very poor, but the direction is usually correct.

Particular.

Detailed Intelligence Tests:

His I.Q. in the Stanford-Binet test was 103, but was almost certainly pulled down as a result of his speech defect, and consequent emotional disturbance. He was very reluctant to speak, would not attempt to repeat sentences or numbers.

In contrast, he did extremely well in the Passalong test -- he worked quickly and accurately, and thought out his moves in advance. He showed great practical ability, as indicated by his I.Q. of 132.

His results in the Progressive Matrices were not so good -- at the 40th percentile point of the scale. His mistakes were interesting in the easier tests, in that they were due to the choice in all cases, of the mirror image of the correct one.

Tests for Handedness:

Rubs:	L.	Scissors:	L only.
Throws:	L.	Winds:	L.
Counters:	both hands equally.	Lines:	18 L- neater. 15 R-untidy.

His writing attempts are quicker and neater with his left hand. He writes mirror-wise well with his left hand -- better than in the correct direction.

He is dominantly left-handed.

Tests for Footedness:

He kicks with his right foot, but uses his left for all other tests.

Left-footed.

Tests for Eyedness:

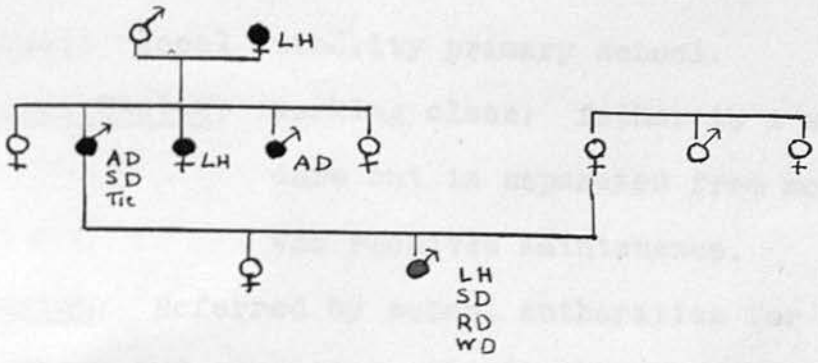
Hole in card:	+ 10.
Cone:	+ 8.
Cylinder:	+ 10.
Toy Telescope:	RH + RE = 5. LH + RE = 4. LH + LE = 1.

Right eye is strongly dominant.

He shows marked crossed dominance.

Case XV. John H.

Family Tree.



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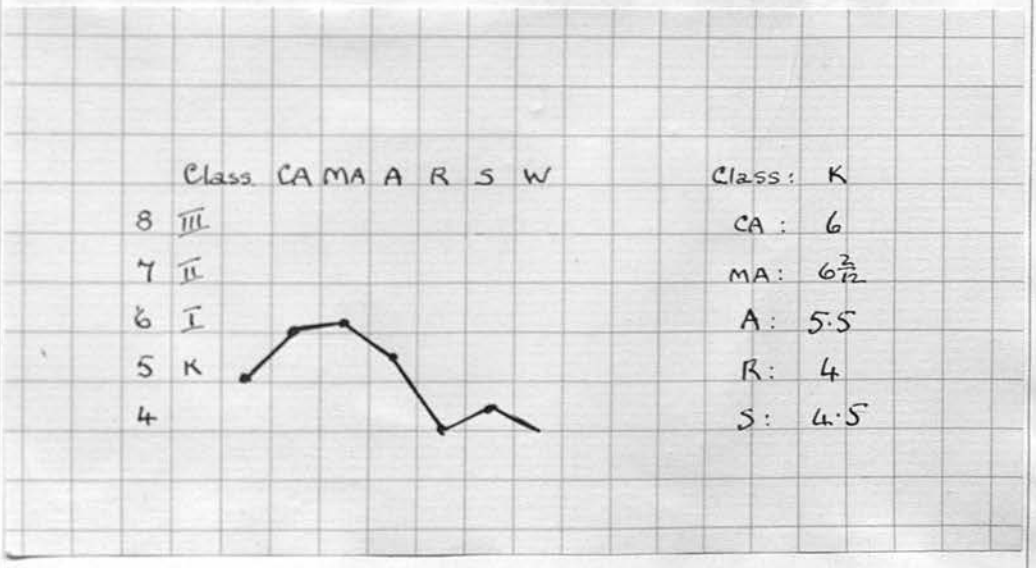


CASE XVI.

Bennie D. Born: 26.7.39. First seen: 5.4.49.

General:

School: local authority primary school.

Social Status: working class: father is a stevedore but is separated from mother who receives maintenance.

Problem: Referred by school authorities for backwardness and enuresis. Shortly before he was sent for, he had a epileptic fit.

Clinical Report and History: There was little abnormality shown in this boy's early development, but at 16 months he became infested with tapeworm, which was not completely removed until he was 6. On one occasion, a 6 foot length of worm was passed. He walked and talked at 13 months, but bowel and bladder control were slow in being established. He is still enuretic at night.

He has been at school since he was 5 but still (at $9\frac{8}{12}$) cannot read. Vision and hearing are normal. His father is an epileptic, and extremely irritable. The children are all terrified of him. Separation was arranged in December 1947, and since then the children have been less nervous.

Bennie has had two epileptic fits -- the first at $7\frac{5}{12}$, the second at $9\frac{8}{12}$. Since the last fit, he has been very cross and irritable. E.E.G. confirms the epileptic tendency.

Bennie hates school and cannot do his school work.

Family History: The father is epileptic, and ambidextrous (? ambilevous). He, and several members of his family have had repeated attacks of rheumatic fever.

Bennie's youngest sister is left-handed -- and another sister has had two attacks of rheumatic fever.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 90.
Alexander Passalong:	I.Q. 93.
Progressive Matrices (1947):	Grade V.

Attainment Tests:

Reading Age:	4.5.
Spelling Age:	4.5.
Writing Age:	6-.
,Arithmetic Age:	8.5.

See Profile.

Degree of Disability: Reading was very poor and hesitant. He spelt letters out orally and built up words in phonic units. He confuses "b" and "d", and "p" and "q", every time, and has considerable difficulty with "t" and "f". There were many kinetic reversals also in the few words he was able to read. Writing is very slow -- he took 90 seconds to write his name -- and the quality is also poor.

He is in a low class at school, which he hates, and has the reputation of being stubborn and lazy.

Clinical Features: This boy's difficulties have

steadily increased as he was moved up the school according to his age. He is now thoroughly antagonistic and loathes school, where he is considered to be mentally defective.

He was found to be predominantly right-handed, and there is no history of any left-handed tendency when younger. He is also persistently left-eyed. His visual acuity is normal, but visual discrimination is not very good. His hearing is normal, and auditory discrimination is excellent.

His general physical condition is poor, and he is very subject to septic infections -- any injury at once becomes septic, and he constantly has septic skin rashes.

His general irritability and stubbornness were not considered to be innate temperamental traits due to epilepsy, but appeared to follow directly upon the frustration at school.

Clinical Handling and Progress: Remedial coaching was undertaken: reading was taught by the phonic method, with stress on the blending of small units. Writing patterns (of the Marion Richardson type) were also given, and he was encouraged to use his index finger as a directional guide. He has had three hours coaching a week for three months now, with some interruptions because of illness, and during this time, he has not been pressed at school, and his general behaviour has improved very considerably. After his last fit, he was put on phenobarbi-

tone, and his irritability lessened at once, but the dose of phenobarbitone was gradually reduced, and recently the drug was stopped without any deterioration in behaviour.

After three months' coaching, his reading age has risen to 6.8, and his writing to 7.5.

Particular:

Intelligence Tests in Detail:

In the Stanford-Binet test, he showed very poor concentration, and his verbal and reading memory were poor. Reasoning was also rather poor.

In the Alexander Passalong test he again showed lack of concentration and persistence, which became very marked as soon as he came up against difficulties in the later tests. His I.Q. in this test was 93 -- not an index of high practical ability. He used his right hand for manipulations throughout.

He was not interested in the Progressive Matrices (1947), and did not bother. After doing the first few tests successfully, he simply chose the pattern exactly similar to the one above the empty space. His score placed him at the 5th percentile level.

His reading was not good enough for him to do Schonell's test properly. He attempted it, but only read two words correctly -- "to" and "pit". All the others showed reversals of single letters or of the whole word.

Tests for Handedness:

Rubs: R. Scissors: R only.

Tests for Handedness, continued:

Throws:	R.	Winds:	R.
Counters:	R.	Lines	R 28. L 16.

He can write his name well with his right hand, but has not facility with the left. He can neither read nor write mirror-wise.

His right hand is the dominant hand.

Tests for Footedness:

He is predominantly right-footed, and used his right foot in all the tests.

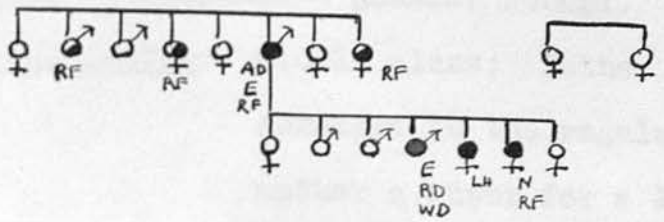
Tests for Eyedness:

Hole in card:	-10.
Cone:	- 8.
Cylinder:	-10.
Toy Telescope:	LH + LE = 4. LH + RE = 1. RH + RE = 2. RH + LE = 3.

He is strongly left-eyed.

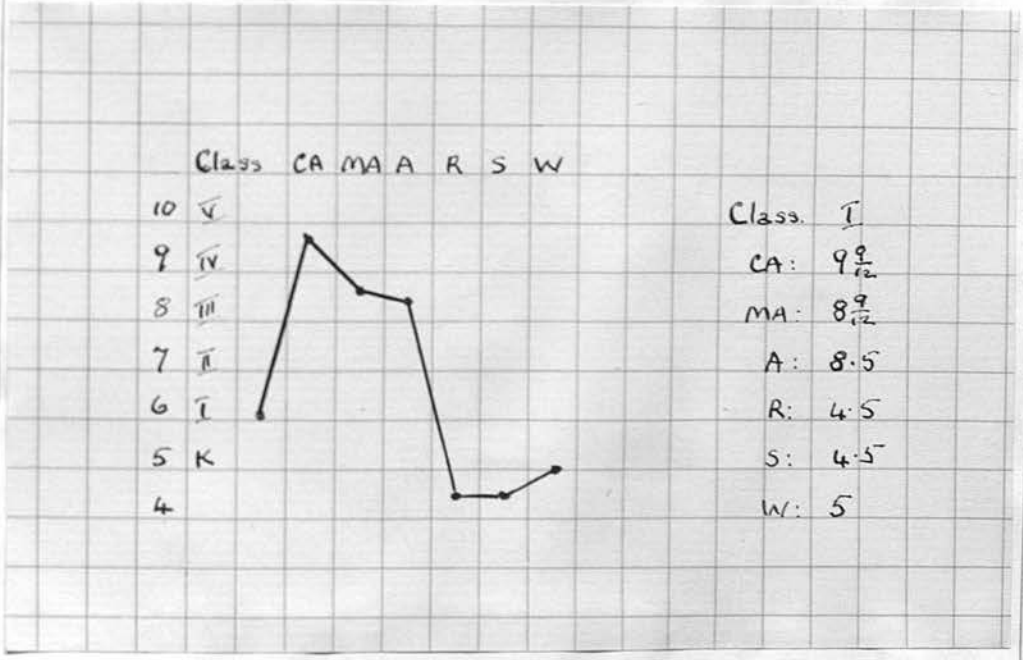
This is a case of marked crossed dominance.

Case XVI. Bennie D.



RF= Rheumatic fever.

Profile.



CASE XVII.

Michael W. Born: 12.11.37. First seen: 7.4.49.

General:

School: independent grammar school.

Social Status: middle class: father a flight-sergeant in the regular R.A.F., mother a buyer for a large store.

Problem: Referred for twitching of face and jerking of arms -- treated as chorea at first. This had begun after he had attended school for two years, and had recurred recently.

Clinical Report and History: Michael's early development was normal, but he was slow in speaking. He echoed "mama" and "dada" at 10 months, but used no other words until he was over 2 -- and then began to use 3 - 4 word sentences fluently.

At the age of 2 he was definitely left-handed, but his mother had"trained him out of it" by the time he went to school, at the age of 5. He was taught reading by "sight" method entirely, and had great difficulty in distinguishing the similar letters, b and d, p and q, n and u, t and f, which persisted for over eighteen months, and then cleared up spontaneously. Writing he found very difficult to acquire, and was constantly being rebuked for untidy, careless writing, and for mistakes in dictation. The nervous movements began shortly after this, but ceased when he was given rest (for chorea). The tics recurred on two occasions when he had been promoted two classes, and bedame

very much worse after he had entered the grammar school with a scholarship, and the pressure on him was intensified.

Physically the boy is in good health, though rather too fat, suggesting slight endocrine imbalance. His hearing and vision are normal, and auditory and visual discrimination excellent.

No tics were noticed during the examination, until questions were asked about schooling, when his right arm jerked, his head shook, and his mouth twitched.

The boy was of very superior intelligence, and had found his intellectual school work easy -- too easy, and therefore had never really worked or taken any trouble. On transfer to the grammar school, standards were raised and pressure was intensified. He was continually reprimanded for his careless, slovenly writing, and his mistakes in (written) spelling, and reacted by developing these nervous habits.

Family History: Paternal grandfather was ambidextrous; paternal uncle was very slow to read, and is still a bad speller and never looks at a book; father is left-handed, mother is very nervous and highly strung. There is no history of strabismus or of speech defect on either side.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 148.
Alexander Passalong:	I.Q. 112.
Progressive Matrices: (1938):	Grade II.

Attainment Tests:

Reading Age:	13.9.
Spelling Age:	11.5.
Writing Age:	9.
Arithmetic Age:	14.

See Profile.

Degree of Disability: Writing was very slow, extremely untidy and irregular, and sometimes quite illegible. When writing to dictation or spontaneously there were frequent omissions and reversals of letters and order of letters. He held his pen very tightly, with his hand and fingers in a cramped position.

Carbon tracing:

they were full of jewels and gold

"they were full of jewels and gold."

Clinical Features: The history of this boy, and a study of his earlier exercise books shows that he had had considerable difficulty in learning to read and write. The reading difficulty cleared up spontaneously, but the writing difficulty has persisted, and reversal errors are also shown in his writing. In the tests for handedness, he lacks any definite dominance, and is definitely amphiocular, so that difficulty was probably experienced in fixing the correct left-to-right direction for reading and writing.

Clinical Handling and Progress: Michael was tested fully to see whether retraining to left-handed writ-

ing should be considered, but the left hand did not seem to be dominant enough to warrant a change at his age.

He was given the Marion Richard son books and advised to practise the patterns and the writing for 15 - 20 minutes every day. He began with painted patterns, then tracing, then freehand writing patterns and finally to writing practice. The principle of this training was explained to him, and he readily grasped this, and persisted for 7 - 8 months.

When he was tested again in December 1949, his writing speed had risen to 148 (2 mins.) and the quality improved -- up to the 11 year level. The tics had been entirely absent for six months.

Particular.

Intelligence Tests in Detail:

In the Stanford-Binet test he was very quick -- too quick for accurate thought. He passed all the XIV tests, 5 adult, 3 superior adult I, 2 superior adult II and 1 superior adult III. He would probably have rated even higher, had he stopped to think.

In the Passalong test, he was again very quick, but did not concentrate or try to think. He gave up too easily in the more difficult sub-tests. In all the sub-tests he held the tray with his right hand and moved the blocks with his left index finger.

In the Progressive Matrices (1938) he rushed the test, completing it in 8 minutes. Although cautioned, he would not take time, and his grading (II at the 75th

percentile points) reflects his lack of care, rather than his ability.

Tests for Handedness:

Rubs:	R. but picked duster up in L first.	Scissors:	R + L equally.
Throws:	R.	Winds:	R.
Counters:	R.	Lines:	R 36. L 34. R neater.

Right-handed writing -- with tendency to backward slope.

Left-handed writing is much neater, and more fluent than is usual in unpractised hand. He was unable to do mirror writing.

He is now right-handed, but with considerable left-handed facility - R + L.

Tests for Footedness: His right foot was used in all tests except to regain his balance, when he used the left foot. He uses either right or left to go up-stairs at home (observed for a week).

He is mainly right-footed - R + l.

Tests for Eyedness:

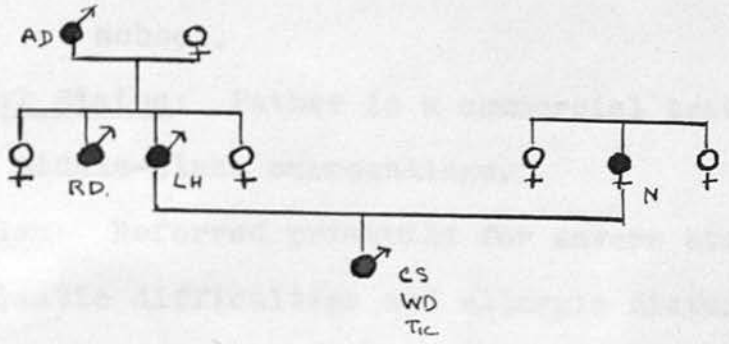
Hole in card:	+ 7.
Cone:	- 1.
Cylinder:	- 4.
Toy Telescope:	RH + RE = 5. LH + LE = 5.

There seems to have been no development of eye dominance -- he can be graded as amphiocular.

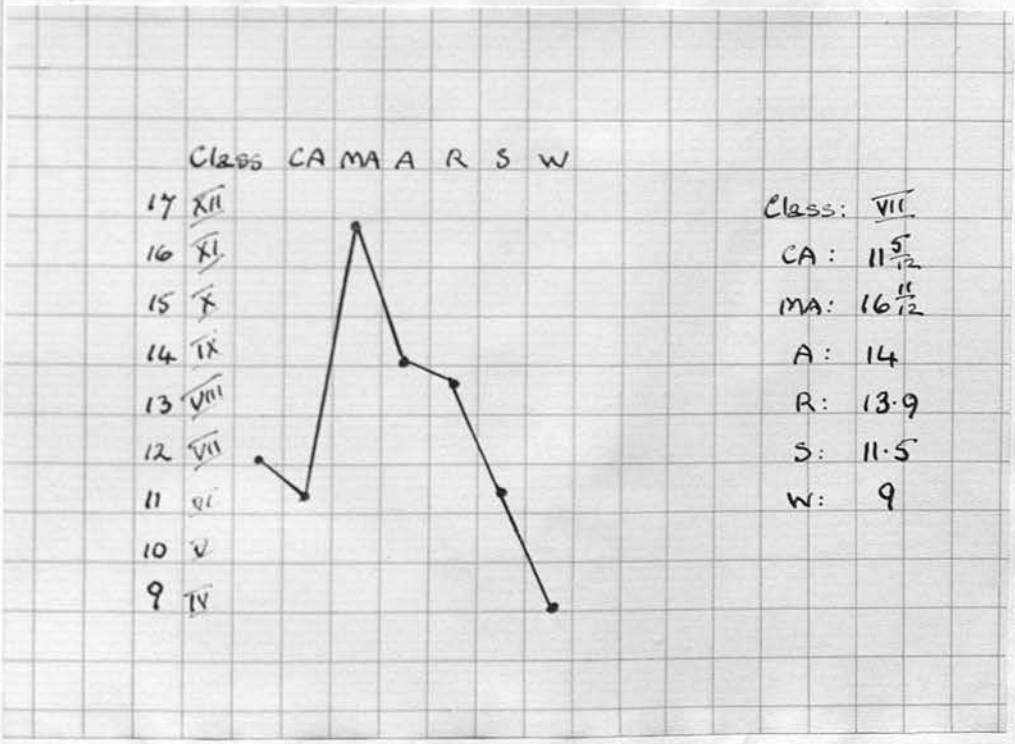
This boy shows incomplete dominance of hand and eye. He is probably a converted sinistral also.

Case XVII. Michael W.

Family Tree.



Profile.



CASE XVIII,

Rosemary M. Born: 27.10.41. First seen: 13.4.49.

General:

School: Kindergarten department of independent school.

Social Status: Father is a commercial traveller -- good middle-class surroundings.

Problem: Referred primarily for severe stammer, but scholastic difficulties and allergic disturbances were also present.

Clinical Report and History: This little girl is an only child, and her development was normal until she was 10 months -- she was crawling, and saying "dada" at this age. She contracted Pink disease, which lasted for six months, and since then she has been delicate. She is subject to asthma and vasomotor rhinitis, and very susceptible to other infections. Further development of speech was delayed until she was $2\frac{1}{2}$ and she began to stammer then too.

Because of her poor health, and the speech defect, she had little contact with other children, and is markedly over protected. She plays by herself, and when she is in a stammering phase she stammers even when talking to herself. Her vision is very poor: she has large macular defects and a very high error of refraction in both eyes. Her right eye is almost amblyopic. Nystagmus is also present, and is very marked at times. She occasionally squints, too. She started school when she was five, but has never

been promoted from the kindergarten class.
She is right-handed, and has never shown any tendency to use the left hand. Her writing however, shows a very definite backward slope. She is unable to progress at school, and is becoming anxious and worried as a result of this -- and the pressure which follows.

Family History: One maternal uncle was very slow in learning to speak -- speech was delayed until he was 3½; another maternal uncle was ambidextrous and has two sons who are both left-handed; mother and aunt had strabismus (convergent) when young.
See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 109.
Alexander Passalong:	I.Q. 90.
Progressive Matrices (1947):	Grade III.

Attainment Tests:

Reading Age:	5.7.
Spelling Age:	5.5.
Writing Age:	6.
Arithmetic Age:	6.8

See Profile.

Degree of Disability: Rosemary's stammer is variable -- sometimes it is absent entirely but seldom for longer than a month. At other times it is very severe, and accompanied by many accessory movements. Even after being at school for two years, she can read very little. Static and kinetic reversals are

very common, and blending of sounds very poor. She succeeds better when she spells the words out aloud. Her writing is poor, slow, irregular and badly formed, with many distortions.

Although she appears socially confident and alert, she reacts to difficulties with marked anxiety and increase of stammer.

She is right-handed, but her left is the master eye.

Clinical Features: In this case it is possible that the crossing of hand and eye may not be a sign of crossed cerebral dominance, but may be wholly, or in part, due to the very defective vision in the right eye. Nevertheless, the occurrence of speech delay, ambidexterity, left-handedness and strabismus in the family history, suggests some anomaly of cerebral dominance may be partly involved. The general nervous instability and the allergic reactions (for which it has proved impossible to trace a physical cause), suggest a rather poor integration of the nervous system.

Clinical Handling and Progress: Owing to this child's very poor vision, much extra coaching was not advised, apart from practice in tracing large letters and the use of large flowing patterns painted in the left- to -right direction, to increase the sense of direction through kinaesthetic memory. The child requires much stronger glasses, but has already had to wait months for these.

Speech therapy has been given, and already her

stammer is much less marked.

Her reading was tested again in December 1949, and was found to have improved slightly -- up to age 6.8. Static reversals were no longer common, but kinetic reversals were still frequent.

Particular.

Intelligence Tests in Detail:

During the Stanford-Binet test she was very restless and distractible. She appeared confident, and only stammered once while doing the test. Reasoning, comprehension and memory for numbers were all much better than sentence memory or the other verbal tests. Practical ability, as shown in the Passalong test, was not very high - her I.Q. was 90 in this test. She peered closely at the blocks and had difficulty in planning the moves.

Her defective vision prevented her from doing well in the Progressive Matrices (1947). She had great difficulty in seeing the details of the patterns, and succeeded best with those patterns showing solid blocks of colour, while she tended to fail with those consisting mainly of lines. This suggests that some of her failure may have been due simply to defective vision.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	R + L together.	Lines:	32 R. 18 L.

She writes with her right hand, but shows some little facility with the left. Mirror-writing is poor with the right hand, and a complete failure with left. She is dominantly Right-handed, with very little left-handed facility. R.

Tests for Footedness:

She uses her right foot in all tests.

Tests for Eyedness:

Hole in card: -10.
The letters were read reversed in this test - b, d, and p.

Cone: -10.

Cylinder: -10.

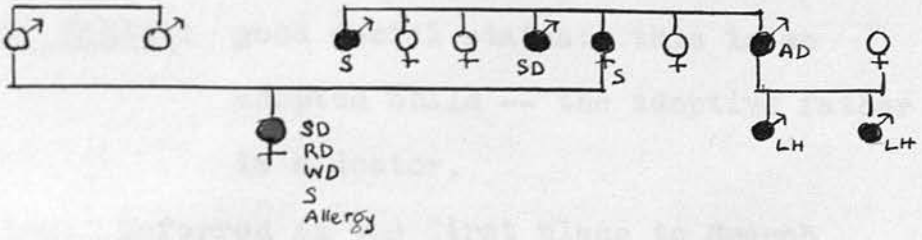
Toy Telescope: left eye in all tests.

The left eye is the master eye.

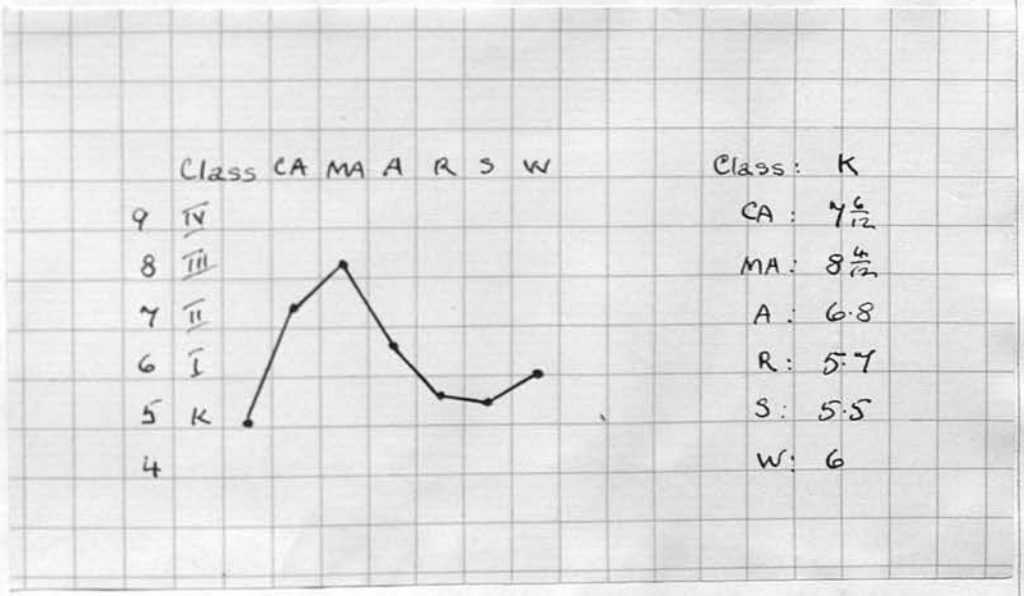
This child shows crossed dominance, partly due to defect in the Right eye, partly due to familial anomalies of dominance.

Case XVIII. Rosemary M.

Family Tree.



Profile.



CASE XIX.

David C. Born 19.9.43. First seen: 25.5.49.

General:

School: private preparatory school.

Scoial Status: good social status: this is an adopted child -- the adoptive father is a doctor.

Problem: Referred in the first place to Speech Therapist, for very severe stammer.

Clinical Report and History: This child was adopted at the age of three months: a health certificate was obtained fron the real parents, but otherwise no details of family history are known. He was no trouble as a baby, and sat up, walked, and talked, on an average, two months earlier than normal (mother has kept careful charts).

He knows that he is adopted, and has always had his questions answered (about sex, parentage etc.) to the best of his parents' ability.

His stammer began about the age of three -- and at the same time he began to have severe temper tantrums. A girl was adopted about six months after this -- and the mother is positive this second adoption had never been mentioned in David's hearing until after the stammer and tantrums had begun.

On further examination, he was found to be extremely clumsy in his movements -- he was constantly dropping dishes -- he would not even attempt to play with any constructional toy -- his attempts at drawing or

writing were very poor and untidy.

He started going to a nursery school at $3\frac{1}{2}$ and transferred to a preparatory school at 5. His stammer and tantrums have both increased in severity since he began to receive formal teaching in reading and writing.

Family History: None available, except that there was no history given of obvious mental abnormality.

Intelligence Tests:

Stanford-Binet:	I.Q. 122.
Alexander Passalong:	I.Q. 118.
Progressive Matrices (1947):	Grade III-.

Attainments Tests:

Reading Age:	5.
Spelling Age:	5.
Writing Age:	very poor, clumsy, incoordinated.
Arithmetic Age:	6.

See Profile.

Degree of Disability: David has a stammer that is at times so severe that it can prevent speech entirely. At other times -- especially holidays times -- it is almost completely absent. He has no defect of articulation.

He is exceedingly awkward and clumsy in most manual operations -- his writing and drawings are clumsy and messy in execution; he has difficulty in tying his tie or shoelaces. His attempts at writing are very poor; the letters are badly formed and untidy, wandering all over the page. He shows some reversals

and transpositions, but is not writing enough to warrant any conclusion being drawn. When reading, he shows many errors of the reversal type -- both static and kinetic -- but if he is cautioned, he is able to correct these without help.

Clinical Features: This boy shows certain difficulties with most of the language functions: his speech defect is the most severe, but he shows reading disability in a mild form, and writing disability to a greater extent. His clumsiness in the finer skills is a moderate degree of developmental apraxia. On detailed examination, it emerges that dominance of hand, eye, or foot has never been properly developed -- he is still largely ambilateral.

Clinical Handling and Progress: Speech therapy was begun, but the boy's stammer became so slight and inconstant after three attendances that this was discontinued. The parents were advised to give him as much practice as possible in the use of his right hand, and he was encouraged to practice the Marion Richardson patterns daily after school. He was also to point along the lines with his right index finger when reading, for several weeks.

He was seen again after six months, and had improved considerably. The stammer had been hardly noticeable for four months. He had been promoted at school, and his reading age had improved to 6.4. His writing -- both speed and quality -- showed very great improvement and was almost up to the 6 year level.

He general behaviour was much more satisfactory, and the tantrums had almost entirely ceased.

Particular.

Intelligence Tests in Detail:

He was most interested and eager in all the tests, but showed considerable distractibility, and was talkative and restless throughout.

In the Stanford-Binet test, he passed all the V and VI year tests, but failed with the diamond drawing and memory tests. He passed the vocabulary and comprehension tests at the VIII year level, giving him a mental age of 7.

In the Passalong test, he used his left hand only for one test, his right hand for two tests and both hands for the subtests in which he failed. He was clumsy, and upset the trays twice. He was apt to cheat (this was also noted in the attainment tests) and blushed furiously when he was caught.

In the Progressive Matrices he was in grade III-, at the level of the 30th percentile point. This was less than was expected, but defective discrimination of the orientations of the patterns appeared to be the explanation.

Tests for Handedness:

Rubs:	L.	Scissors:	R.
Throws:	R.	Winds:	both hands equal.
Counters:	R + L together.	Lines:	R. 26. L. 25.

He writes with his right hand, but shows considerable facility with his left.

He cannot do mirror-writing.

Hand dominance seems to be incompletely established: he appears to be ambilateral, with possibly a slight bias to the Right - R + L.

Tests for Footedness:

Either foot is used, without any apparent preference, in any test. Repeated tests and observation failed to show any preference.

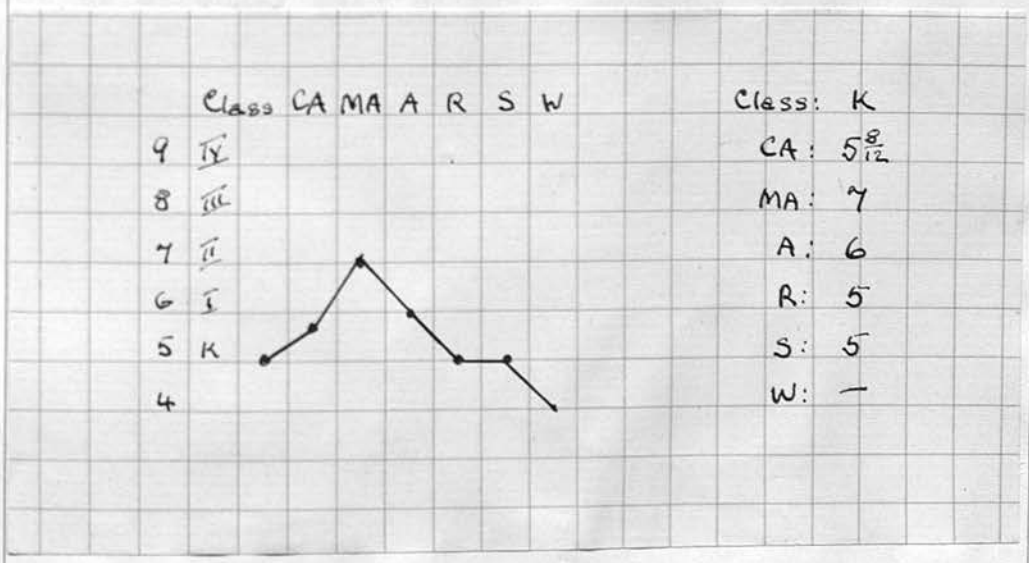
Tests for Eyedness:

Hole in card:	- 4.
Cone:	- 2.
Cylinder:	- 2.
Toy Telescope:	Eye and hand associated: RE + RH = 5. LH + LE = 5.

Slight tendency to left-eyedness. L + r

Dominance of hand and eye are as yet incompletely established, though there is a slight tendency to right hand and left eye dominance.

Profile.



CASE XX.

Brian B. Born: 18.3.35. First seen: 1.7.49.

General:

School: independent grammar school (scholarship).

Social Status: lower middle class: father is a supervisor in corporation employment.

Problem: Referred to clinic for advice about career -- he is very anxious to join the Royal Navy, but has a stammer.

Clinical Report and History: This boy had no trouble in infancy and development was normal. He began to speak at 20 months,but was very silent and sparing of words until he was $3\frac{1}{2}$. His stammer began at 4 and was said to have been precipitated by a severe fright. This stammer is variable, sometimes completely absent , and seldom severe.

He does very well at school, and has the ability to pass the Dartmouth examination, but his stammer would certainly prevent his acceptance.

He is strongly left-handed, and has been allowed to write with his left hand, except for one period at the age of 8, when pressure was brought to make him use his right hand.His stammer, however, became very much worse, so the effort was abandoned. He is rather quiet and withdrawn, and prefers solitary reading to social pursuits. He takes part in games, and is in the under-15 Rugby team, and cricket team.

Family History: Shows a very strong tendency to speech defects and to left-handedness, on both sides.

his mother is very nervous, has a facial tic and speaks with a definite lisp: she is left-handed; one great-aunt is epileptic and another is hysterical; one maternal uncle is left-handed, and his son stammers; another cousin is left-handed. On the father's side, one aunt is left-handed, and her son stammers.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 137.
Alexander Passalong:	I.Q. 116.
Progressive Matrices(1938):	Grade II+.

School work above the average -- takes 5th place in a class of 31 where average age is $15\frac{1}{2}$.

Degree of Disability: The stammer is slight-repetitions of initial consonants-- but is seldom completely absent. Speech is slowed down very little, and there are no accessory movements. There is no associated defect of articulation.

There was no interference with the other language functions in this case -- or at least they were so slight as to cause no delay or scholastic failure.

Clinical Features: The stammer caused no disturbance or distress until the question of a career was considered. The boy was extremely anxious to enter the Navy, and of course, could not be considered on account of his stammer. He sought treatment for his stammer in the vain hope that he might be accepted. He is strongly left-handed and right-eyed. This

crossed dominance caused him little trouble with learning, but it was noted that when forcible re-training to right-handed writing was attempted, his stammer became very much worse.

The ambition to join the Navy was found to arise from two ideas: first the wish to leave home, where his mother was pressing him too much, because of the father's ill health (coronary thrombosis); and secondly, the knowledge that two cousins who stammered, had joined the Navy, and their stammers had ceased thereafter.

Clinical Handling and Progress: The boy received five months' speech therapy, with considerable benefit. The stammer recurs when he is nervous or excited, e.g. at an examination, or after a Rugby match. He has also received psychotherapy and has gradually come to see that he is not really suited for Naval life, and is now considering other careers.

Intelligence Tests in Detail:

In the Stanford-Binet, he showed very good reasoning powers and comprehension; his vocabulary was very good, and he showed a strong verbal bias. There was very little scatter and his I.Q. was 137.

In the Alexander Passalong test he used his left hand throughout for manipulation. His practical ability, shown by his I.Q. of 116, was not so high. Nevertheless he showed considerable planning ability.

With the Progressive Matrices (1938) he showed good reasoning ability, and his scores were consistent.

He was in grade II+ at the 90th percentile point.

Tests for Handedness:

Rubs:	L.	Scissors:	L.
Throws:	L.		better than R.
Counters:	L and R - L picks up more.	Winds:	L.
		Lines:	L 24. R 18.

He writes with his left hand, but cannot write properly with his right. He cannot write mirror-wise. He bats left-handed in cricket, but bowls right-handed - his only right-handed activity.

He is predominantly left-handed.

Tests for Footedness:

He kicks right-footed, the result of Rugby practice. All other activities are left-footed, and his left foot is the dominant foot.

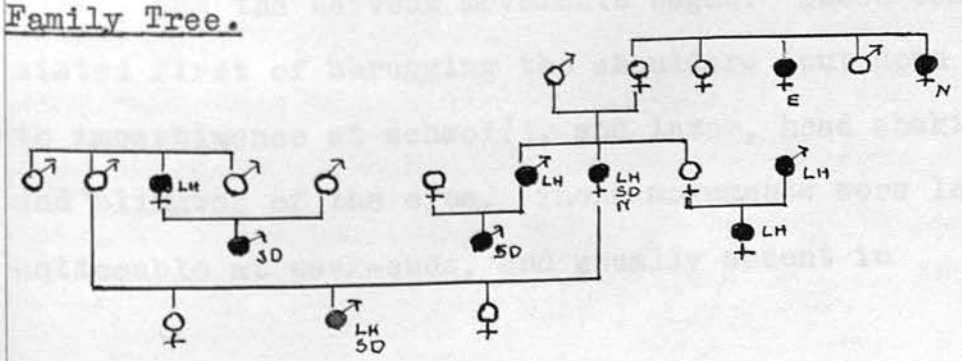
Tests for Eyedness:

Hole in card:	+ 10.
Cone:	+ 8.
Cylinder:	+ 10.
Toy Telescope:	RH + RE = 5. LH + RE = 4. LH + LE = 1.

His right eye is the master eye.

He therefore shows a marked degree of crossed dominance.

Family Tree.



CASE XXI.

Brian R. Born: 2.9.38. First seen: 26.7.49.

General:

School: local authority primary school.

Social Status: Father is a machinist -- the home is of the comfortable working-class type.

Problem: This boy was referred to hospital as suffering from chorea, but was transferred to the Child Guidance Clinic as the movements were not choreiform, but nervous tics.

Clinical Report and History: Brian had a normal infancy and childhood until starting school. He walked and talked when he was about a year old. About this time right hand preference was noticed and he has been constantly right-handed ever since. He began school at 5½ and liked it at first, but after a year he began to get into trouble for "bad work" -- especially reading and spelling. For a short time he had a slight stammer. He had a succession of ear and nose infections about this time and his schooling was frequently interrupted until he had his tonsils and adenoids removed at 7½. After this his health improved, but school difficulties increased -- he was caned daily for "careless work", and the nervous movements began. These consisted first of shrugging the shoulders (put down to impertinence at school!), and later, head shaking and blinking of the eyes. These movements were less noticeable at week-ends, and usually absent in

school holidays, but were becoming very severe in school hours.

His general health is good. Vision normal in both eyes: no errors of refraction, but he had a squint between 2 and $3\frac{1}{2}$. Hearing was affected when he was having the ear trouble, but is now unimpaired (tested by the pure tone audiometer).

Family History: Maternal uncle was left-handed, but had to write with his right hand at school; first cousin on father's side has a stammer; eldest sister is predominantly left-handed, but writes with her right hand; youngest sister is left-handed, did not begin to speak till she was $2\frac{1}{2}$, and has a slight stammer.

See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 123.
Alexander Passalong:	I.Q. 134.
Progressive Matrices (1938):	GradeIII+.

Attainment Tests: Arithmetic Age: 11.5

Reading Age:	9.2.
Spelling Age:	9.
Writing Age:	10.5.

See Profile.

He is also exceptionally good at handwork.

Degree of Disability: This boy's reading was very slow. He made many mistakes, most of which were reversal errors, both of letters and syllables. He still showed considerable confusion between "b" and

"d". When his attention was drawn to these errors, he corrected them, but the whole reading process was exceedingly slow and laboured. In Schonell's test of directional attack, he made 22 errors, some of which he corrected spontaneously, however.

His reading was almost entirely by means of spelling out the word letter by letter. Oral spelling was rather better than his reading, but written spelling was worse, showing many reversals and alterations of letter sequences.

Clinical Features: This boy was very predominantly right-handed, but was found to be strongly left-eyed. His learning at school had been hindered by this crossed dominance, with, in addition, an impairment of hearing. At this time, also, he developed a slight stammer, while he was feeling the strain of learning new functions of language.

Improvement had been expected after his operation, with the improvement in hearing. Unfortunately this boy was a pupil at a school notorious for its harsh and unsympathetic disciplinary methods, and in consequence, the nervous tics developed as a result of the emotional strain.

Clinical Handling and Progress: Intensive remedial coaching was carried out, with particular stress on directional training with the development of manual cues to reinforce the visual: tracing of letters, writing patterns, and finger-pointing when reading. These methods were also helped by allowing the boy

to use a typewriter.

He has already used the oral method of reading for himself, so added practice was given with small units in the sight method, with frequent pauses for revision of the directional training.

He has now been promoted one class, but his reading has already improved from 9.2 to 12.2, and spelling in proportion. He is now near the top of his class and much happier at school. The tics have now been entirely absent for six weeks (December 1949).

Particular:

Intelligence Tests in Detail:

He passed all the XII year tests in the Stanford-Binet, with ease. He was however unable to visualise the paper cutting or the plan of search.

In the Passalong test, he proceeded confidently and quickly, using his right-hand all the time. He failed in subtest 5, but after being shown it, proceeded to complete tests 6, 7, and 8, with ease, only failing in the last test. Considerable practical ability is indicated and this is confirmed by his excellence in drawing and handwork at school.

In the Progressive Matrices he did reasonably well also, reaching grade III+, at the level of the 70th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	R + L. more with R.	Lines:	R 30. L 20.

He writes with his right hand only, and performs all tests, skilled and unskilled, with his right.

The right is the dominant hand.

Tests for Footedness:

He is constantly right-footed in all the tests.

Tests for Eyedness:

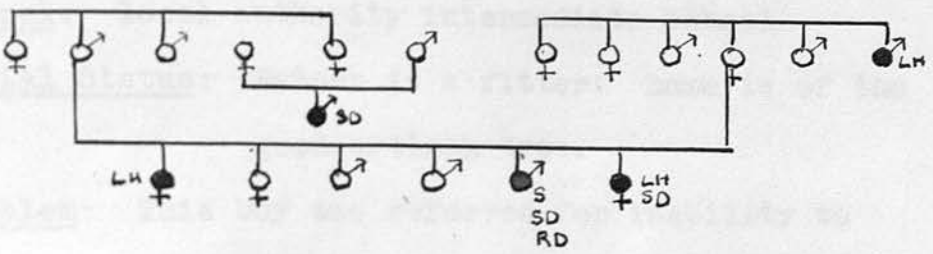
Hole in card:	-10.
Cone:	- 8.
Cylinder:	-10.
Toy Telescope:	RH + LE = 5. LH + LE = 5.

He is consistently left-eyed.

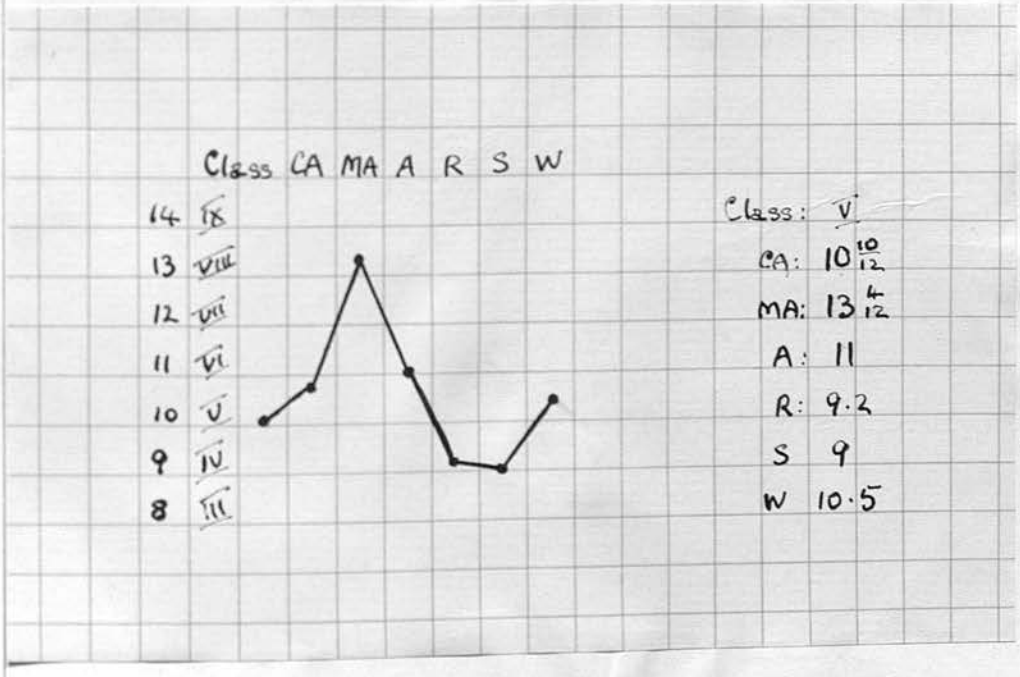
This boy shows marked crossed dominance.

Case XXI. Brian R.

Family Tree.



Profile.



CASE XXII.

Bryan McA. Born: 26.6.37. First seen: 2.9.49.

General:

School: local authority intermediate school.

Social Status: Father is a fitter: home is of the good artisan type.

Problem: This boy was referred for inability to read. He had also become childish in manner and cried very easily.

Clinical Report and History: Bryan was a normal baby, and walked and talked at about 13 months. There were no difficulties until after he started school at 5. From the outset he had considerable difficulty in learning to read; he drifted on from class to class, and became more anxious and depressed. He was subjected to considerable pressure at home, and given extra work to do, while at school, he was either ignored as a defective, or caned for stupidity. Eventually, one master, finding that strictures and punishment only made matters worse, advised the parents to see a specialist about Bryan. Bryan is now very restless and fidgety : he is emotional and cries easily, and is beginning to shun social contacts. His mother is apt to show that she feels he is useless: "he is no use in the house, he can't even wring out a cloth". He is evidently clumsy but this is possibly emotional in origin. He is in good physical health, although he suffered from attacks of vomiting between the ages of 5 and 7.

His vision and hearing are normal.

Family History: There is no significant disability on the father's side of the family; the maternal grandmother was strongly left-handed, and had an attack of menopausal depression; maternal grandfather and Bryan's sister have marked convergent strabismus; mother's first cousin is left-handed. See Family Tree.

Intelligence Tests:

Stanford-Binet:	I.Q. 122.
Alexander Passalong:	I.Q. 88.
Progressive Matrices (1938):	Grade II.

Attainment Tests:

Reading Age:	8.7.
Spelling Age:	8.5.
Writing Age:	11.
Arithmetic Age:	12.3.

See Profile.

Degree of Disability: The boy wept and said he could not read at all, at the first interview. His reading disability is fairly severe, and although he can read, when his emotional blocking has been overcome, he is only able to reach to a little below the 9 year level. His reading was excessively slow -- he pointed to each word and spelled it out, letter by letter. There was a considerable number of reversals, but he corrected these spontaneously, but very slowly. In Schonell's test, he had 15 reversals, 11 of which he corrected at once, spontaneously. In his early

exercise books, brought by his mother, static and kinetic reversals were very common.
His arithmetic was good, and his writing normal for his age.

Clinical Features:- The disability began to cause trouble at the start of his school life. It is probable that the vomiting attacks which occurred between 5 and 7, and for which no physical cause had been found, were due to anxiety about school. The retardation increased as he moved up the school, and the secondary emotional factors developed. These were aggravated by inconsistency at school -- sometimes extreme pressure and punishment, sometimes absolute neglect. At home his parents criticized him constantly and gave him extra work. It is natural that he developed extreme inferiority feelings and babyish behaviour. He could not settle -- he was restless and fidgety -- and the clumsiness noted by his mother was due to anxious expectation of adverse criticism and not to apraxia.
He had however a tendency to ambilaterality. He was right-handed for most tasks, but used his left hand more frequently than is usual; and also showed more than normal facility with this hand. He is predominantly left-eyed.

Clinical Handling and Progress: It was pointed out to Bryan how well he had done in the intelligence tests, and he was reassured as to his capacity. An explanation was given to him of the cause of his

difficulty and the method of treatment. He was encouraged to come for coaching -- but he was consulted as if the matter lay largely in his own hands. He reacted well to this attitude, and has had three months coaching in directional methods mainly, and also with sight training, as he already has considerable grasp of phonic methods. His parents were advised to cease criticism, to stop extra work, and to praise whenever possible. After three months, the improvement has been marked: his reading age has jumped from 8.7 to 11.2 -- although he still reads "on" for "no" -- and he is now in a class with 12 year olds and is able to keep up with them fairly well in reading, and to surpass them in most other subjects. His reading remains slow, but is improving daily, and he is now reading for pleasure. All the secondary emotional symptoms have diminished and his behaviour is more stable and mature.

Particular:

Intelligence Tests in Detail:

Bryan was keen and interested in the Stanford-Binet test -- especially when he found reading was little involved. He failed in the plan of search and the paper cutting, but passed all the XIV tests, and and some of the average adult, giving him a mental age of $14\frac{10}{12}$. His vocabulary was surprisingly good, in view of his reading difficulty.

In the Passalong test, he was clumsy in his movements; he used his right hand in the first two tests, but in

the later ones, he used both hands equally. His practical ability is not nearly so high as his general intelligence and he showed defective planning of his moves.

In the Progressive Matrices (1938) he showed good ability, reaching grade II at the 75th percentile point.

Tests for Handedness:

Rubs: R - but picked up the duster with L.

Throws: L, but missed basket - tried again successfully with R.

Counters: R + L equally.

Scissors: R only.

Winds: R.

Lines: R 23. L 20.

Writing is right-handed, but he can write unusually fluently and neatly with his left.

He uses both hands well, with slight bias to the R.-- R + L.

Tests for Footedness:

He used alternate feet in the tests -- he has developed no foot preference.

Tests for Eyedness:

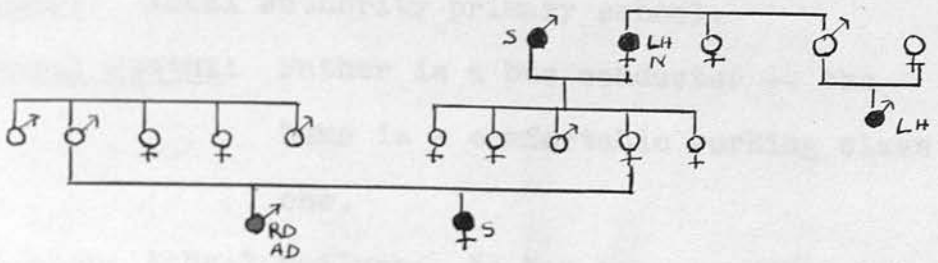
Hole in card:	-4.
Cone:	-6.
Cylinder:	-10.
Toy Telescope:	LH + LE = 5. RH + LE = 3. RH + RE = 2.

His left eye is definitely dominant.

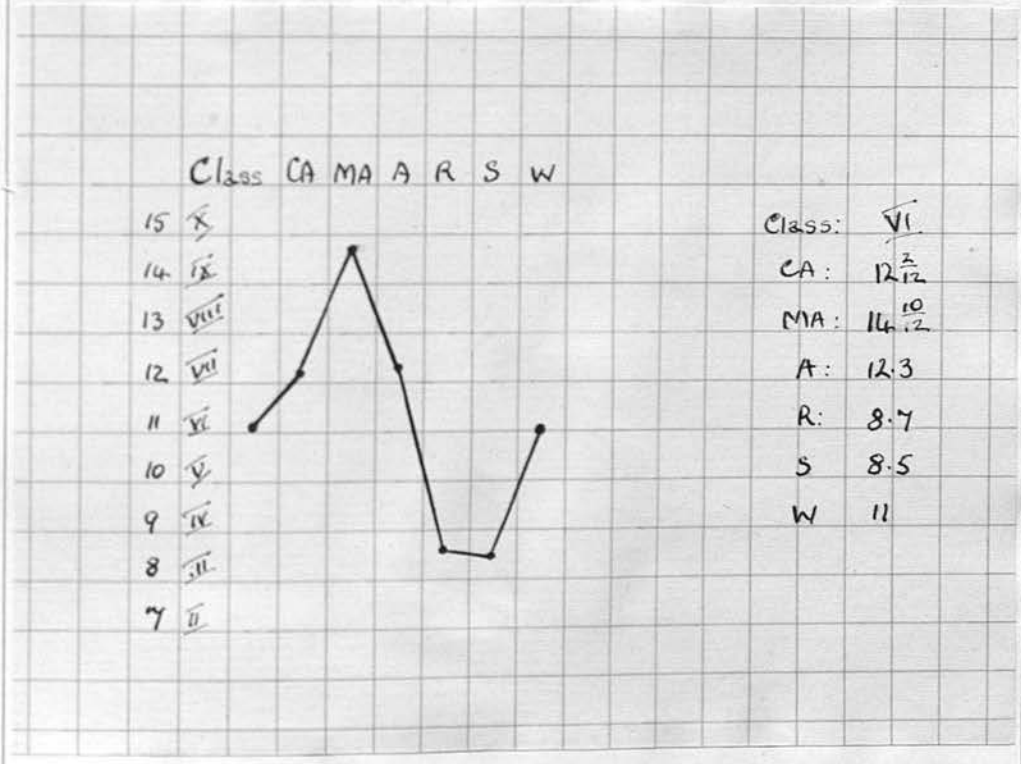
He shows left eye dominance, and incomplete hand dominance, with a tendency to right hand dominance beginning to appear.

Case XXII. Bryan McA.

Family Tree.



Profile.



CASE XXIII.

Albert A. Born 17.8.40. First seen: 7.9.49.

General:

School: local authority primary school.

Social Status: Father is a bus conductor -- the home is a comfortable working class one.

Problem: School failure: he has been spending hours over his homework and has become nervous and afraid of school.

Clinical Report and History: His birth was normal and he was a strong thriving baby at first. At five weeks, he nearly died of double pneumonia. At four months he was ailing for a week and then took convulsions: he was in the fever hospital for eight weeks with meningitis, and was not expected to recover. His right eye was affected then , and still turns so that only the white is visible, when Albert is over tired or over excited.

His later development was normal in spite of this setback: he walked at 13 months and talked at 14 months. There was no recurrence of convulsions with teething.

He began school at 5, changed his school at $7\frac{1}{2}$, and returned to his original school at $8\frac{8}{12}$. Since this return, he has become nervous and worried about his work. He is very careful and painstaking about his homework, but is in constant trouble for "carelessness and laziness" at school. He was promoted to a higher

class in August, and his nervous symptoms increased so markedly that advice was sought.

He is in good physical condition and his hearing is normal. Vision in the left eye is normal, but he has had amblyopia of the right eye since the meningitis. He has great difficulty with reading and spelling at school, and is regularly caned for "careless mistakes". He has become very nervous and worried, and now has frequent nightmares, and loss of appetite.

Family History: There is nothing significant in the family history -- no left-handedness, squint, speech defect, etc.

Intelligence Tests:

Stanford-Binet:	I.Q. 95.
Alexander Passalong:	I.Q. 97.
Progressive Matrices (1947):	Grade III+

Attainment Tests:

Reading Age:	5.2.
Spelling Age:	5.4.
Writing Age:	8.4.
Arithmetic Age:	8.4.

See Profile.

Degree of Disability: Reading was nearly four years retarded, spelling the same, while writing and arithmetic were nearer the level of his mental age.

In reading, simple reversals of letters were rare but kinetic reversals of syllables and whole words were very common: "on"for "no", "was" for "saw", "top" for "pot". In Schonell's directional test, he had

20 errors, of which 17 were directional. Now that reading is becoming more necessary for his other subjects (grammar, history, etc.) he is feeling the strain far more and developing secondary symptoms of inferiority and anxiety.

Clinical Features: This boy is definitely right-handed, and has always been so, according to his mother. He lost the sight of his right eye at 4 months, and perforce has a dominant left eye. In his case the crossed dominanceis acquired, but the symptoms are exactly parallel to those seen in cases of developmental reading difficulty. In this case there is no family history of any anomaly such as left-handedness or speech defect -- nor does the boy himself show any other anomaly.

Clinical Handling and Progress: Remedial coaching has been given by the method of stressing the phonic elements and reinforcing visual methods with oral and kinaesthetic cues.

He was encouraged to trace letters before reading them and also to practise the Richardson writing patterns, to fix the correct directional attack.

He was reassured as to his ability and was told something of the reason for his difficulties.

A visit to the school by the social worker produced a more sympathetic attitude in the teacher.

Owing to travel difficulties coaching was only intermittent, but at the end of three months his reading had improved by over a year. His general

emotional state had improved to a very marked degree -- he was boisterous, happy, and less afraid of school.

Particular:

Intelligence Tests in Detail:

In the Stanford-Binet he cooperated well, and obviously tried hard. His reasoning, comprehension and memory for number were good, his verbal memory not so good, while he failed completely in the paper cutting and designs: his drawings for the latter bore no resemblance whatever to the originals.

In the Passalong test he was slow, and had no confidence in his ability to do the tests. His hands hovered over the blocks for some time before he attempted to move. His practical ability is at the same level as his Binet I.Q.

In the Progressive Matrices his results were lower than expected -- he only reached grade III- at the level of the 30th percentile point.

Tests for Handedness:

Rubs:	R.	Scissors:	R.
Throws:	R.	Winds:	R.
Counters:	R.	Lines:	R 21. L 13.

He writes with his right hand and cannot use his left.

He cannot do mirror writing.

His right hand is the dominant hand.

Tests for Footedness:

He kicks with either foot -- as a result of football

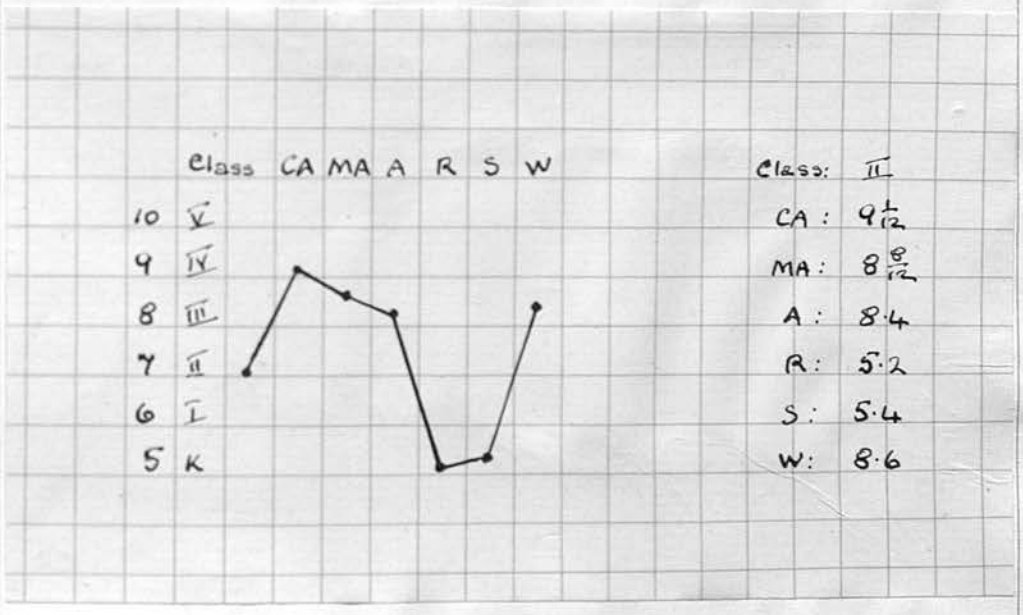
practice. In all other tests and observation, he is right footed.

Tests for Eyedness:

He is blind in his right eye and therefore must use the left always.

This case shows crossed dominance of hand and eye, acquired as a result of meningitis. There are no other associated anomalies, and no significant factors in the family history. Although he shows the specific reading disability, he should not be considered to belong to the specific group.

Profile.



CASE XXIV.

Brian McC. Born 5.2.45. First seen: 21.10.48.

General:

School: not yet started.

Social Status: Father is a machinist: comfortable surroundings of the artisan type.

Problem: Severe stammer and nocturnal enuresis.

Clinical Report and History: Brian was a normal baby: sat up at 6 months, walked at 14 months, but did not begin to speak until he was 3, and has stammered since he was 3¼, and the stammer is getting worse. He is very nervous and clings to his mother, refusing to let her out of his sight.

The stammer and the enuresis have greatly increased since the birth of a younger sister, although no overt jealousy is shown. Until he was 2½, Brian used his left hand almost all the time, but recently has been changing to the use of the Right hand.

Family History: Shows significant trends on both sides: paternal uncle has a stammer, another was left-handed, and couldn't read, but was not simple; a paternal cousin stammers; maternal aunt was left-handed and slow to read; Brian's sister was left-handed as a baby, but was trained out of it, and is now right-handed and left-eyed; youngest sister is persistently left-handed.

See Family Tree.

Intelligence Tests: Stanford-Binet: I.Q. 103.

His defective speech and emotional instability probably made this lower than the true result.

Progressive Matrices (1947): Grade IV.

Degree of Disability: This child's speech development was very poor: he had a severe stammer and a defect of articulation as well, as he distorted the sounds, "S", "Th", and "R". When he could not say what he wanted, he became very frustrated and angry and often aggressive, kicking anyone who came near him: at such times, his emotional language consisting of swear words, would be quite fluent! His difficulty in communicating with others made him reluctant to leave his mother, and he is overdependent.

Clinical Features: At the first interview he appeared to be left-handed, but later on, laterality seemed to be changing. He was definitely left-eyed. His emotional state is probably secondary to the stammer and the frustration caused by the speech defect. His stammer and enuresis both got much worse after the birth of the youngest child.

Clinical Handling and Progress: Nothing could be done for this child's stammer until his confidence was gained, and for several months he attended a play group -- with his mother sitting in the doorway. Owing to his mother's illness, attendances ceased, but began again in September 1949. Since then he has become more independent, and plays with the other children without requiring his mother's presence.

The stammer is much less marked, but the speech defect is still there, though less noticeable. He is beginning to use his right hand now, by preference. Brian is due to start school shortly and his progress in reading and writing will be watched, as some difficulties are to be expected, in view of his family history, and his own lack of dominance.

Particular:

Intelligence Tests in Detail:

It was extremely difficult to get cooperation, and the child's mother had to be in the room. He required constant encouragement and praise. He did the drawing tests successfully, but failed (through refusal to speak) in some of the tests involving description.

His I.Q. was provisionally given as 103.

In the Matrices , he was also uncooperative, and only reached grade IV at the 25th percentile point.

Tests for Handedness: (given December 1949).

Rubs:	L.	Scissors:	failed with both hands.
Throws:	R.	Winds:	R + L equal.
Counters:	R + L. equal.	Lines:	R 4. L 3.

Hand dominance is not yet decided -- is probably ambilateral at present, and tending to become R.

Tests for Footedness:

He is at present definitely left-footed.

Tests for Eyedness:

Hole in card: -6.

Cone: -4.

Tests for Eyedness, continued:

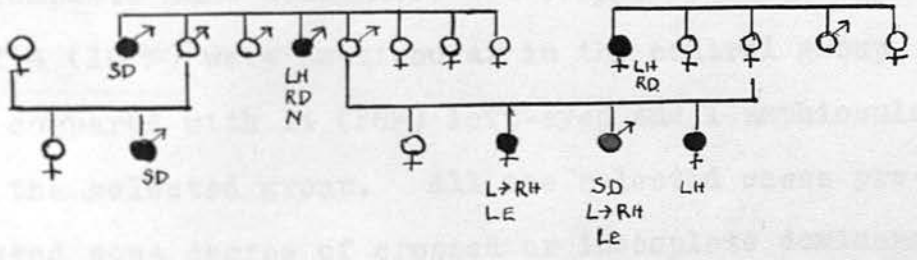
Cylinder: -10.

Toy Telescope: RH + RE = 5.
LH + LE = 5.

Left eye shows definite dominance.

This little boy has not yet developed hand dominance -- though he is tending towards right-handedness: he has left eye dominance now, and trouble may arise later from crossed dominance. In the hope of preventing this, he has been given practice in painting and writing patterns, using his right hand, during the last three weeks.

Family Tree.



Discussion of Cases.

(A). Selected cases and "control" cases:

For the purposes of comparison with these twenty-four cases of incomplete dominance, a series of twenty-four was taken from the waiting list of the Child Guidance Clinic, each being the next, in date of referral, to one of the selected cases. These "control" cases were tested briefly for eye and hand dominance, and a family history, with special reference to the specific genetic abnormalities mentioned earlier, was taken from each one. No child whose I.Q. was below 76 was included, and all the children were of school age. The results are shown in Table I.*

In the control series, 4 (16⅔%) were left-handed, while in the selected group, 7 (29%) were left-handed, and a further 7 (29%) were "ambidextrous," or showed incomplete hand dominance. 8 (33⅓%) were left-eyed, and 4 (16⅔%) were amphiocular in the control group, as compared with 14 (58%) left-eyed and 1 amphiocular in the selected group. All the selected cases presented some degree of crossed or incomplete dominance, while less than half, 11 (45.6%), showed this in the control group.

The comparison of the occurrence of significant genetic abnormalities in the family histories of the two groups also shows material differences. In each group there was one child, who being adopted, had no detailed family history available. Of the remaining twenty-three selected cases, twenty had a family

* page 194.

history containing significant genetic abnormalities: if twinning is to be included as being of genetic significant in this field, this number rises to twenty-two -- a very high proportion. The only remaining case in this group, with no significant family history, was the boy whose crossed dominance arose from an acquired cause -- case XXIII.

In the control series, eight out of twenty-three had a family history with some significant traits: five had a family history of speech defect, four of left-handedness, one of strabismus, and two of epilepsy. In the remaining fifteen cases, there appeared to be little abnormality in the family histories, and none of the special traits considered significant in this study. The control cases had all been referred to the Child Guidance Clinic for various neurotic and behaviour problems, excluding any of the language disturbances: it was to be expected that these cases would show a higher amount of instability in the family history than in the general population, but even so, the proportion shown in this group is less than half the amount of significant family history shown in the selected group.

The proportion of boys to girls (21 boys to 3 girls) is also much higher in the selected group; the boys still predominate in the control group, but to a lesser extent -- fifteen boys to nine girls. The number of cases investigated is of course too small to have any real statistical significance, but

the figures quoted above agree with those of other observers, such as Burt (1937)[46] and Eustis (1949)[46].

(B). Summary of Findings in selected group. (Table II)*.

Of the 24 cases, 21 were boys and 3 were girls. The average level of intelligence was above normal: only two cases had an I.Q. below 80, cases IV and VIII with I.Q's. of 76 and 79 respectively; 10 others had I.Q's. between 90 and 110, and the remaining 12 had I.Q's. of over 110 (6 were over 120). It is evident therefore, that neither these disabilities, nor the confused dominance which has so much bearing on them, are necessarily a sign of low intelligence. The two boys with the highest intelligence (I.Q's. of 151 and 148) had each had considerable difficulty between the ages of 5 and 7, with reversals in reading, according to the histories, but had succeeded in correcting this tendency unaided.

Various degrees of crossed dominance of hand and eye are shown, and in many other cases the dominance appears to be incompletely developed. There were 12 cases showing pure crossed dominance, 7 of right-hand and left eye, and 5 of left hand and right eye. Four more showed mainly right-handedness (R + l) associated with left-eyedness, and 1 showed mainly left-handedness (L + r) associated with right-eyedness. Two further cases showed incomplete dominance of both hand and eye; two more showed incomplete hand dominance, with the master eye on the same side as the slightly more dominant hand, while the last

* page 195.

three cases showed incomplete hand dominance with the master eye on the side of the less dominant hand, pointing to the ultimate development of some degree of crossed dominance. Of the 24 cases, at least 5 could be classed as shifted or converted sinistrals.

Twenty-three of the selected cases were of school age, and of these, only 4 exhibited a single, uncomplicated anomaly; the other 19 had two or more associated anomalies, while 5 presented at least 4 types of anomaly: delay in speech development, speech defect (articulatory or stammer, or both), reading disability (which includes spelling) and the writing disability and/or exceptional awkwardness. No cases of "word deafness" or "congenital auditory imperception" have been seen at the Child Guidance Clinic in the last four years.

Two cases may be said to have acquired the crossed dominance as a result of post-natal disease: case XVIII, where vision in the right eye is almost completely absent as a result of the macular degeneration following Pink disease; and case XXIII where amblyopia of the right eye followed meningitis. In case XXIII, reading was the only function affected, and there were no significant genetic factors in the family history -- the main difficulty appears to have been in the coordination of right-hand and left-eye, and the maintenance of the left-to-right direction of eye-gaze, which is the less "natural" direction for the left eye. In case XVIII however, there

is a strong family history of left-handedness, speech defect, and strabismus which suggests that there is here a strong hereditary predisposition to these anomalies; the presence of speech defect and allergy (of psychological origin), as well as reading and writing disabilities, indicate an defective integration of the nervous system, and that this case ought to be included amongst those of developmental origin.

School failure, to a greater or lesser degree was noted in 18 of the 23 school children: and the typical educational profile was shown to be ⟋⟍ instead of a smooth curve or more or less horizontal line. Of the five cases who did not fail at school, one XIX was only in his first year at school; three (II, XI, and XX) had speech defects only, and one (XVII) had an exceptional I.Q. (148) and had managed to keep up, in spite of his writing disability; nevertheless this boy's mental age was far higher than the average of his class, and his educational profile resembled that of the "school failures", to a considerable extent.

Only three children in the group showed no accompanying nervous signs: two of these were the highly intelligent stammerers (XI and XX) and one was the boy with the amblyopia (XXIII). In most of the other cases the symptoms could be classed as secondary reactions to the inferiority feelings, or anxiety , the exceptions being case IV, with heredit-

ary colour-blindness, and case XVI, with epilepsy.

In only four cases did a very thorough investigation of the history suggest any confirmation of Blau's theory of emotional negativism caused by maternal rejection in infancy. In case I, feeding difficulties had occurred during breast feeding, which greatly distressed and upset the mother; the negativism however, was only shown for a brief period between the ages of 2 and 3 (probably the normal negativistic phase) and did not recur until after school age, when the reading difficulty had become acute. In case XII, there was obvious and lasting maternal rejection, and in this case, tantrums and negativism had been prominent -- and continuous -- from the age of 3. In case XIII, the health of both mother and child had deteriorated after the birth, and the mother stated that she "got fed up with him" -- and still does; this boy has suffered continuously from acidosis, night-terrors, later associated with aggressiveness and uncontrollable behaviour. The last child (XIX) was adopted in infancy, and has always known of his adoption: nevertheless he may feel that he has been rejected by his own mother, though this could not be elicited; he has had tantrums since he was three.

A study of the family history of these cases shows many associated factors. Of these twenty-four cases, one child, owing to his adoption in infancy, had no detailed family history available, while case XXIII

mentioned above, was considered to be an essentially acquired condition. Of the remaining 22, every one had some significant genetic anomaly in the family history -- see Table III*. The term anomaly is used advisedly as simple left-handedness is not considered an "abnormality" by most observers, nor is the occurrence of twinning.

86% (19) have a family history of left-handedness; 50% (11) give a history of delayed speech or speech defect in other members of the family; 31% (8) have a family history of strabismus; 31% (8) have a family history in which some other members have had considerable difficulty in learning to read; and in 55.5% there was a family history of mental or nervous instability. In four families there was a history of twins: Gordon[40] (1921) and Gesell[17] (1947) suggest that is of genetic importance in any study of this subject, but Blau[5] (1946) is not in agreement.

These twenty-four selected cases all confirm, therefore, the close association between mixed forms of dominance and the various types of language disability, with a strong tendency for some, or all of these anomalies to be shown in the family history.

* page 196.

Table I.

	SELECTED CASES.						CONTROL GROUP						
		Sex	I.Q.	Dom. Hand.	Dom. Eye.	Family History		Sex	I.Q.	D.Hand	D. Eye	Family History	
1	A.K.	M	120	R+l	L	+	J.D.	M	100	R	A	−	
2	J.McD.	M	119	R+l	L	+	T.M.	M	77	R	R	−	
3	M.A.	M	106	R+l	L	+	M.H.	M	106	R	R	0	
4	C.R.	M	76	R	L	+	R.McC.	M	94	R	R	−	
5	G.H.	M	91	R+l	L	+	C.McC.	M	120	R	R	+	SD
6	C.P.	M	117	R+L	R	+	J.H.	F	95	R	R	−	
7	J.P.	F	96	L	R	+	A.T.	F	99	R	L	−	
8	R.McC.	M	79	L+r	R	+	D.M.	M	108	R	L	−	
9	N.D.	M	99	R+L	R	+	H.L.	F	115	R	R	+	SD
10	N.G.	M	97	R	L	+	J.P.	M	79	L	L	+	S& SD
11	A.E.	M	151	L	R	+	D.S.	M	100	R	A	−	
12	J.C.	F	115	R	L	+	W.M.	F	105	L	R	+	E& LH
13	J.A.	M	115	L+R	R	+	G.K.	M	124	R	R	−	
14	R.W.	M	111	L	R	+	T.P.	M	100	R	R	−	
15	J.H.	M	103	L	R	+	R.W.	M	78	R	L	−	
16	B.D.	M	90	R	L	+	C.C.	F	98	R	R	−	
17	M.W.	M	148	R+L	A	+	D.K.	M	104	R	L	+	LH
18	R.M.	F	109	R	L	+	E.D.	F	90	R	A	−	
19	D.C.	M	122	R+L	L+r	0	G.A.	F	80	L	L	+	SD& LH
20	B.B.	M	137	L	R	+	E.M.	F	112	R	L	−	
21	B.R.	M	123	R	L	+	C.H.	F	130	R	L	−	
22	B.McA.	M	123	R+L	L	+	H.S.	M	106	R	R	+	E& SD
23	A.A.	M	95	R	L	−	T.G.	M	110	L	A	−	LH
24	B.McC.	M	103	R+L	L	+	J.M.	M	100	R	R	−	

Table II.

Selected Cases.	Sex.	Age when 1st seen.	I.Q.(Stanford-Binet).	Dom. Hand.	Dom. Eye.	Sp.Delay.	Sp.Defect.	Strabismus.	R. Defect.	W. Defect.	Fam. History.	Sch. Failure.	Behaviour Problems & other Neurotic Symptoms.
1 A.K.	M	9 3/12	120	R+l	L	+	-	-	+	-	+	+	+ negativism
2 J.McD.	M	5 1/12	119	R+l	L	-	+	-	-	-	+	-	+ aggressive
3 M.A.	M	13 9/12	106	R+l	L	+	-	-	+	+	+	+	+ pilfering
4 C.R.	M	9 10/12	76	R	L	+	+	-	+	+	+	+	+ colour-blind
5 G.H.	M	8 5/12	91	R+l	L	-	-	-	+	+	+	+	+ tic & enuresis
6 C.P.	M	9 5/12	117	R+L	R	-	-	-	+	+	+	+	+ temper tantrums
7 J.P.	F	6 7/12	96	L	R	+	-	-	+	+	+	+	+ anxiety
8 R.McC.	M	8 6/12	79	L+r	R	+	+	-	+	+	+	+	+ anxiety
9 N.D.	M	10 9/12	99	R+L	R	-	-	+	+	+	+	+	+ anxiety & delinquency
10 N.G.	M	9 1/12	97	R	L	+	-	-	+	-	+	+	+ tics
11 A.E.	M	11 10/12	151	L	R	-	+	-	?	-	+	-	-
12 J.C.	F	8 10/12	115	R	L	-	-	+	+	-	+	+	+ pilfering
13 J.A.	M	6 11/12	115	L+R	R	-	-	+	+	+	+	+	+ clumsy & accident prone
14 R.W.	M	6 4/12	111	L	R	+	+	-	+	+	+	+	+ tics
15 J.H.	M	6	103	L	R	+	+	-	+	+	+	+	+ nervous vomiting
16 B.D.	M	9 9/12	90	R	L	-	-	-	+	+	+	+	+ epilepsy
17 M.W.	M	11 5/12	148	R+L	A	-	-	-	-	+	+	-	+ tics
18 R.M.	F	7 6/12	109	R	L	+	+	+	+	+	+	+	+ allergy
19 D.C.	M	5 8/12	122	R+L	L+r	-	+	-	+	+	0	-	+ clumsy
20 B.B.	M	14 3/12	137	L	R	+	+	-	-	-	+	-	-
21 B.R.	M	10 10/12	123	R	L	-	+	+	+	-	+	+	+ tics
22 B.McA.	M	12 3/12	123	R+L	L	-	-	-	+	-	+	+	+ nervous vomiting
23 A.A.	M	9 1/12	95	R	L	-	-	-	+	-	-	+	-
24 B.McC.	M	3 8/12	103	R+L	L	+	+	-	0	0	+	0	+ enuresis

Table III.

Family History.

Selected Cases.	Left-handedness	Speech Delay	Speech Defect	Strabismus	Reading Disability	Twinning	Nervous Instability.	
1 A.K.	+	+	+	+	+	-	-	
2 J.McD.	-	-	-	-	-	+	+	asthma
3 M.A.	+	-	-	+	-	-	-	
4 C.R.	-	+	+	-	-	-	+	colour-blindness; M.D.
5 G.H.	+	-	+	+	+	+	+	neurosis
6 C.P.	+	-	-	-	-	+	+	neurosis
7 J.P.	-	-	-	-	-	+	-	
8 R.McC.	+	-	+	-	+	-	-	
9 N.D.	+	-	-	+	+	-	+	psychopathic instability
10 N.G.	+	+	+	-	+	-	-	
11 A.E.	+	-	-	-	-	-	+	neurosis
12 J.C.	+	-	-	+	-	-	+	epilepsy
13 J.A.	+	+	+	-	+	-	-	
14 R.W.	+	-	-	+	-	-	+	manic-depressive
15 J.H.	+	+	+	-	-	-	+	tic; neurosis
16 B.D.	+	-	-	-	-	-	+	epilepsy
17 M.W.	+	-	-	-	+	-	-	
18 R.M.	+	+	-	+	-	-	-	
19 D.C.	o	o	o	o	o	o	o	
20 B.B.	+	+	+	-	-	-	+	epilepsy; hysteria
21 B.R.	+	+	-	-	-	-	-	
22 B.McA.	+	-	-	+	-	-	+	involutional melancholia
23 A.A.	-	-	-	-	-	-	-	
24 B.McC.	+	-	+	-	+	-	-	

TREATMENT.

Treatment as recommended by various authorities:

According to Witty and Kopel[44] (1939), most teachers and psychologists declare that there is no specific reading disability of the type described, and it is certainly true that the majority of educators appear to include these cases described above with all other backward readers (except mental defectives). Nevertheless, most psychiatrists and a few psychologists, especially those who work in close contact with various types of Child Guidance Clinic, are convinced that amongst these backward readers, there is a small group of children with this specific type of language disorder. These children are frequently above the average in intelligence, and to include them in classes of backward readers, who are often dull in other ways, would set up such emotional reactions that the "remedy" would undoubtedly confirm, and in fact, aggravate the disability. In addition, backwardness in reading may arise from many different causes and requires as many differing methods of treatment, and, for reasons emphasized below, in the specific disability, a period of intensive, individual, coaching at the outset, gets the best results. One point that indicates the differing attitudes of the educators and the physicians is that the former tend to concentrate on one language function only, i.e. reading, while the psychiatrists and clinical psychologists prefer to study and treat the child as a whole and combine

reading coaching with psychotherapeutic methods and retraining, where necessary, of other affected functions. This method is essentially individual, and therefore time-consuming and expensive, but the results are far better than those obtained by any group method.

Each authority whose work has been described in the earlier sections of this thesis, has devised methods of treatment: these differ to a certain extent, but there is a considerable measure of agreement amongst them all.

Orton[10] (1937), at the outset, stresses the importance of considering the child as a whole, and as an individual. In different children, the visual, auditive and kinaesthetic factors associated with "language", are combined in varying proportions, while the emotional reaction of each child to his difficulty, shows equal variations. It is essential that, before treatment is formulated, a careful and thorough analysis of every aspect of the case be made.

As his initial studies of the reading disability (1925)[17] had indicated that the main difficulties were in the blending of units into sequences -- his later studies (1937)[10] showed that this held good for speech defects and motor awkwardness also -- his broad guiding principle was therefore to seek for units that could be easily blended, and to give training in this blending. He has found that the flash-card

(word-whole or sight) method of teaching reading is bad for these children -- the emphasis is too much on speed, and this simply aggravates the visual confusion. Reinforcement of the defective factor (visual) by other factors (oral and kinaesthetic) was used to build up a complete association and memory image. The child was taught to trace (kinaesthesis), sound and name (oral) the letter, as well as to look at it carefully; the direction of reading was also fixed in the left-to-right direction by pointing with the finger; these alone were not enough, however, and practice in blending the sounds phonetically was equally necessary. These children must also be helped to associate the printed letter with the sound, and the sound with the printed letter: this is necessary for spelling and therefore phonetic analysis is required as well as synthesis. For the proper use of the phonetic method, accuracy of speech is necessary, and speech training is required in many cases.

Each step in the linkages in both synthesis and analysis must be constantly tested -- there must be frequent drills and revisions, but interest must be maintained, which means that material within the child's capacity, but with interest content adequate for his age, must be provided. Drill is necessary, certainly, but the maintenance of interest and morale is absolutely essential.

Orton advises daily periods of instruction lasting for half to one hour, but considers it better to break this time up into frequent short periods of

intensive study and effort. It is also advisable that this coaching should take place during school hours, to avoid giving the child the impression he is being "kept in". One point that is often overlooked, is that the child should also be receiving oral instruction in his other subjects (history, geography, etc) to prevent him falling behind in these subjects also.

In severe cases, this treatment may have to be prolonged for years. Usually a period of intensive coaching lasting six to twelve months can be followed by less frequent individual treatment, or coaching in small selected groups. Before deciding upon the amount of coaching that will be required, the background of the case must be studied -- the social background of the family, the intellectual level, and the probable vocational interests. Lengthy coaching will be required for a boy who plans a university career but is unnecessary for another who hopes to take up farming.

As a rule, Orton does not consider the conversion of handedness to be necessary in cases of developmental alexia (specific reading disability) unless there is some associated motor defect like stutter, agraphia or apraxia. He believes these special training methods do not necessitate change of hand or eye in cases of uncomplicated reading disability.

Orton[45] noted that cases of specific reading disability were three times as common in schools using

the sight method only for the teaching of reading, as in schools which used the phonetic method wholly or partly. He advises the selection of these cases at the time of entry into school, and points out that the child's handedness and family history can guide the teacher in this selection. There should be an analysis at the end of the first year, of all children who are having difficulty in learning to read, so that remedial methods may be applied before the development of secondary emotional troubles. Those children who have been left till they are much older, often show difficulty, not so much in recognition of words, as in the comprehension of sentences and paragraphs. These older children are usually helped very considerably by having someone read out their other lessons to them.

In the treatment of agraphia, which is primarily a motor function, each case must again be considered individually, on its merits. There must be careful examination and tests of the two hands before any decision is made to change the hand used for writing. Converted sinistrals can often write well with the right hand, but show a very low fatigue threshold; these converted sinistrals however can be easily retrained to write well with the left hand if required. The decision must be made for each case individually, and must be subject to review after a few months. Some strongly left-handed children have nevertheless poor, cramped writing with the left

hand and show rapid improvement when trained to right-hand writing. Whatever type of writing is used, it is essential to see that the slant of the paper is correct -- the paper must be slanted with the top border to the right, when left-handed writing is used.

Agraphia is frequently found in those who were late in fixing laterality -- these children should be trained to feel rather than see the writing, and should have much practice in copying, especially cursive script.. During remedial training, they should be relieved of the pressure of written work at school.

Orton has only treated a very small number of cases of word deafness (congenital auditory imperception) -- the condition is very rare -- but he again bases his treatment on the assumption that the difficulty lies in the recall of sequences. Oral and phonetic units are taught until they can be correctly perceived and reproduced, and then blending follows. There is emphasis on the reinforcement of the defective auditory factor by visual (reading and lip-reading) and kinaesthetic factors (the feel of the muscles used in speech), the latter being taught by a qualified teacher of phonetics.

For the treatment of motor speech delay, Orton recommends first, training in the echoing of phonetic units, this being followed by training in blending, all neologisms and infantilisms being corrected. He considers that this should be done before the child

starts school, to avoid his being ridiculed there. Many of these children have shown delay in choosing the master hand, and Orton advises training one hand (the more preferred, as shown by tests), in games such as quoits, or tiddlywinks. Spontaneous improvement is the rule in this disability, but the extra-training undoubtedly helps, even if it only increases the child's self-confidence.

In the treatment of apraxia, or motor awkwardness, the principle followed is to find simple movements that the child can perform and by training and practice, blend these into more complex patterns. In extreme cases, the basic movements of walking, running, stopping and turning may even have to be taught initially. Combined with the training of the child, the reactions of parents and teachers to the disability must be modified, and ridicule and punishment must be replaced by tolerance -- and, at most, mild amusement. It must be stressed that practice will improve the condition eventually.

Stutterers are divided by Orton into two main groups: those who stammer at the beginning of speech, and those whose stammer begins between the ages of 6 and 8. In the first group, the pattern of handedness should be studied -- if the patterns are good on the abandoned side, retraining of that side may be considered. All stutterers are not left-handed but many show what Travis[29] and Orton call "inadequate lead control", and in these cases practice to increase the

lead of one hand is useful, although this training has usually more success in cases showing motor speech delay. In the older group, retraining to left-handed writing may be useful, but a decision m must be made separately for each individual case, and the change may be experimentally made. In doubtful cases, such as those showing ambilaterality, training to improve the more dominant hand is required.

Stutterers are often helped to read fluently by tracing the initial letter of every word -- later this can be reduced to every second or third word. This helps in reading, but propositional speech is always more difficult to improve. Treatment of the emotional factor is very important -- and often difficult in stutterers. These children frequently resent therapy; they have often had inconsistent discipline because of their "nervousness". Constant reassurance, with reduction of oral responses at school to a minimum, is required.

The emotional factors in <u>all</u> the disabilities must be treated. These children are usually intelligent, and reassurance about their capacities, and and explanations of their difficulties arising from mixed or incomplete dominance, are often successful, and are preferable to explanations based on "nervousness".

Orton and Travis (whose main preoccupation is with speech defects) both study and treat the <u>whole</u> child. <u>Travis</u>[19] <u>(1931)</u> treats his speech cases by a combination of methods: speech exercises -- comparable to the

phonetic training of Orton -- and exercises in correct articulation; breathing exercises and training in relaxation for the stutterers; general hygiene, mental and physical, including general attention to the physical health, and psychotherapy for any mental symptoms; exercises in speaking, singing, verse-speaking, and writing patterns, all of a rhythmic character. Travis also endeavours to increase the "motor lead" and by training and practice to increase the amount of unilaterality; he advises that during this training period, skilled bimanual activities such as typing or piano-playing, should cease.

Blau[5](1946), however, is very dogmatic, and recommends that all children should be trained to dextrality; he believes that allowing a child to choose his preferred side for himself is equivalent to encouraging left-handedness. He advises the training of children in the nursery school, or younger, to right-handedness, and suggests that parents and teachers should watch for signs of left-handedness as shown by the child's actions, and in his drawings (in drawings by left-handed children, trains and figures are almost invariably shown proceeding towards the right). His detailed method of training is very useful, and closely follows that described by Burt in 1937: all writing with pencil and paper (or slate), with the left hand, is stopped; the child is asked to draw on the blackboard, with

chalk, and using his right hand. These three new activities stimulate interest, and the child draws large figures and designs, using the large arm muscles; later these designs (circles etc.) are contracted and the smaller muscles of the wrist and hand are brought into use; this is followed later by practice in flowing patterns, and only after considerable practice in this way, with the acquisition of ease and skill, is writing with pencil and paper begun.

The attitude of the teacher is very important -- there must be no pressing or harsh driving, but, following Blau's theories, by sympathy and encouragement, the teacher should endeavour, more or less to take the place of the (rejecting) mother.

Blau, like some other authorities, believes there is no causal relationship between left-handedness and the language disorders, and that therefore it is unnecessary to treat stutterers by retraining the hand. According to his theory, however, it is important to recognise persistent sinistrality in the small child (in contradistinction to the occasional use of the left hand in continuing ambilaterality, or where left-handedness is encouraged by the family) as a symptom of some deep emotional disturbance and that thorough investigation at some psychiatric or child guidance clinic may be advisable. He recognises that it may be unwise to force re-training later.

If the child is emotionally conditioned against

retraining, he should be adequately reassured, and then taught the best way of adjusting to sinistrality -- by choosing the position of his desk, and lighting, the slope of the paper and method of holding the pen, which are the most suitable.

In cases of specific reading disability, Blau advises that reading-gaze-direction should be taught first, by the use of blackboard and pointer, and later with the finger on the book. As improvement occurs, the use of finger pointing can later be dropped. Writing helps to fix the gaze-direction, and should be begun early. The above methods are applicable to beginners, but remedial work differs, as the child has already got bad habits of partly or completely reversed orientation of reading or writing -- if complete, mirror-writing results, if partial, there is vacillation and confusion superadded. The teacher must be sensitive to the child's reactions, and only after the emotional problems have been overcome, can the disabilities be remedied. Graduated exercises in reading and writing are recommended, proceeding slowly, with stress on direction fixing by the use of pencil, pointer, or tracing methods. Blau advises against too much attention being given to the quality of the writing, and feels that the child may also be confused with too much phonetic training; in general he follows Gates' methods of training.

Eustis (1948,[46] 1949[16]) accepts Orton's observations

and methods, though he does not agree with his theories. He, too, stresses the importance of training every child to unimanual skill, and in almost every case, this training should be in habits of right -handedness, and carried out in the pre-school years. He excepts from this training those children whose left-handedness seems unusually strong and which is reinforced by a strong family history of left-handedness, but believes that all others should be trained to be right-handed as early as possible. He believes moreover, that a change of hand in an older child should rarely be considered.

In the treatment of specific reading disability, Eustis recommends that correct eye-gaze-direction should be fixed first, before any attempt at reading is made. In these cases, the direction should be firmly established by training mind, eye, and fingers in close association, by means of black-board writing and pointing, tracing, and copying writing patterns, all with emphasis on the left-to-right orientation. He postpones the teaching of reading for as long as two years, after which the child is taught by a combination of sight and phonetic methods. It is therefore necessary to test and separate out these children at the earliest possible stage in their school lives, as the training can then be carried out in the schools, in groups, before any secondary symptoms have developed. If treatment is not begun till later, it will take

longer, and be much more expensive, and difficult.

Once these cases have been diagnosed, Eustis considers it most advisable that each child should have some individual teaching, as the psychotherapeutic benefit of this is usually very great. These children require specific treatment for a specific disability, not just "remedial reading" in a backward class. Ordinary schools cannot as a rule provide this initial individual training, so it has usually to be undertaken by some clinic such as the Language Clinic, or Child Guidance Clinic. The individual teaching must be regular and intensive -- half an hour daily, during school hours-- and only reduced when real progress has beem made. Later training may be continued at school under a sympathetic teacher who has been instructed in the special methods, but even after the child's reading age has caught up with his mental age, re-tests, and occasional brief periods of revision will continue to be necessary. It is very obvious that the earlier these cases are found and training begun, the less disability will have to be corrected, and the time required for retraining will be so much the less.

A teacher (Koehler, 1948)[47] closely associated with Eustis, has worked out a training method, based on these theories, whereby he has broken up most of the usual letter combinations used in English, into 94 phonetic units, and he trains the children to look at, say, and write these "units" and, when a

few have been learned, to blend or combine them. His method lays stress on the oral (phonetic) method, and training in accurate observation, without any emphasis on speed.

In agreement with most other psychiatrists Eustis emphasises the importance of maintaining a good relationship between teacher and pupil, and the need for constant reassurance and encouragement to counteract such secondary inferiority feelings as may be developed.

The methods of Gates and Monroe have not seemed so successful in these children with the special language disabilities, though their results in the teaching of other types of backward reader, have rightly gained a very good reputation.

Gates,[30] by reason, presumably, of his theory that the dominant eye is the factor of importance in most cases of mixed dominance and the disabilities arising therefrom, concentrates almost entirely on purely visual methods of teaching reading, especially the flash-card or whole-word method -- although he has introduced the highly successful activity methods to be used in conjunction. The word-whole method trains the child to read whole words at speed without analysis and synthesis and is now in use in most schools in America. It is believed by many observers -- Orton and Eustis among them -- that the modern, wide-spread use of this sight method is the cause of the apparent increase in the amount of specific

reading disability found there in recent years.

Gates gives little consideration to any association between the reading disability and anomalies of speech or handedness, and his methods of treatment are consequently more circumscribed, and confined to the specific disability in reading only. Nevertheless his emphasis on the stimulation of interest, and his method of associating reading with pictures and various activities such as cutting out, matching pictures and words, the making of individual books, and the construction of a picture dictionary, are of great value when combined with the methods recommended by the other authorities. The picture dictionary, in particular, can be very useful in directing the child's attention -- and gaze -- in the right direction, to the initial letter of the words, and so helping to fix, by practice, the correct eye-gaze direction.

Unlike Orton and Eustis, Gates does not consider that the kinaesthetic factor is of much importance, and believes that the impressive results obtained by Fernald and Keller[48] (1921) from the use of this factor resulted rather from the close observation implicit in their methods.

Monroe's[51] (1932) analysis of the various types of error commonly made by children with specific reading disability, is most valuable, but the methods she advises for remedial coaching appear to consist mainly of phonetic drills, without sufficient emphasis on interest. Most of the children who are sent for

treatment for specific reading disability have already failed to benefit by this drill method, and have already become emotionally conditioned against any further repetitions.

Burt[14] (1937) does not give much space to the consideration of the association of the various language disabilities with anomalies of handedness, but tends to study each anomaly separately. In his survey of left-handedness, he discusses fully the advisability of retraining sinistrals to the use of the right hand, but insists on the necessity for a full study of each child individually before any decision is made. He thinks that all children should be deliberately encouraged (and gently trained) to use the right hand, before the onset of speech, and points out that this can easily be done if the mother or nurse makes a practice of presenting objects invariably to the child's right hand, and so placing his chair that it will be easier for him to reach out with his right hand for anything he wants. Any later retraining that is required, should be completed before the child leaves the lowest class in the infant school at the latest. He has observed that those who are not completely left-sided (in eye, hand, and foot) usually retrain easily, but that it is, as a rule, wiser to leave the completely unilateral and persistent sinistrals unchanged.

A detailed method of retraining is described by Burt for the younger school child -- this was

adopted by Blau (described above) and has proved very successful. He has also found the Marion Richardson[49] method of teaching writing by the use of writing patterns very valuable for this purpose, and for use with nursery school children also.

Burt has found that, in his experience, retraining alone never produces stammering -- only when the stress involved is too great does stammering occur. He believes that the stammering which occurs with the beginning of writing is due not to the use of one particular hand, but to the added strain of converting sound symbols into written symbols; and that at the age of 8 (the next critical age), when the child is promoted from the easier and more tolerant atmosphere of the infant school to classes where lessons are taken more seriously, the extra strain may again produce a stammer.

Speech training, both for defective articulation and stammer, Burt considers should be carried out in school, by teachers, provided the defects are mild. If the defect is severe, however, he advises training at a speech centre for from three to four hours weekly, and finds that after a few months the child has so improved that he can take his place in class without fear of ridicule. He summarises the treatment of stammering under four heads: (1) the emotional factor is sought and treated by psychotherapy; (2) the intellectual factor (poor verbal imagery) is dealt with by encouraging the child to

fix his thoughts on what he is uttering, and to think out what he wants to say beforehand; (3) the motor factor: the child is given practice in synthesis -- building up words and sentences until speech becomes fluent; (4) environmental readjustment where necessary. Burt therefore employs a wide approach, covering these four factors -- but is still more apt to consider "factors" than the whole child, as is the practice of the psychiatrists.

Similarly, in his consideration of the reading disability, it is described as a separate entity and not in association with the other anomalies to any extent. Burt recommends Schonell's[4-3] methods of treatment of the various types of reading backwardness, including the specific disability with the others. These methods are fully described by Schonell in his work: "Backwardness in the Basic Subjects", and they combine and modify the interest and activity methods of Gates, with a very considerable proportion of phonetic material. More stress is laid on the use of phonetic methods of teaching with kinaesthetic reinforcements of tracing, writing and the use of manual cues such as pointing with the finger while reading.

Schonell begins with "memory reading" -- to establish confidence -- of a short, easy poem, the reading cues being given as the child repeats the poem he has learned. Next, words are chosen by the pupil, connected with some topic of interest (e.g. Red Indians), and these are learned by saying,

tracing, and writing from memory, and finally collected in the picture dictionary. This tracing, writing and memorisation is applied to all new words while the phonetic training is continued. The children are encouraged to use manual cues -- pencil or finger pointing; cursive script is used also to strengthen the kinaesthetic patterns; reading and spelling are associated closely and constantly; the sound-tracing method of learning new words is used as much as possible, and writing is employed to fix the left-to-right direction.

Schonell notes that much practice in phonetic blending is advisable for these pupils, and especially for those with associated speech defects. He also emphasises the necessity of providing adequate interest content in the reading material used for older children, and of helping these older children to acquire adequate comprehension of the more complex material, by having it read to them. These older children are also very apt to become bored with the type of reading book that they are able to read. It is essential that the content of the books should be adequate for the child's intellectual capacity. It is indeed useless to give a bright child of ten, with the reading disability, a book made up of statements that the cat sat on the mat -- he must instead make up his own book, learning all the new words as he goes, by the combined methods of tracing, saying, and writing.

Treatment as used in this series of cases:

After study of most of the authorities quoted above, a provisional scheme of treatment was evolved for use in these cases. Throughout the period of treatment, the needs of the child as a whole were kept under review, and the detailed methods of treatment were constantly modified to suit each individual case. The major portion of the time, after the initial interviews, was devoted to the "symptomatic" treatment -- or training -- of the separate anomalies, but psychotherapy of the child as a whole was invariably continued alongside. A combination of the methods of treatment advised by Orton and Eustis, mainly, with selected modifications drawn from the work of other authorities in varying degrees, seemed to give the best results, but it cannot be stressed too often that the variations between child and child are manifold, and the application of any rigid scheme of therapy would, by its rigidity alone, defeat its own object.

In general, the method of treatment was considered under two heads: first, the treatment of the whole child, and secondly the treatment of the particular disability or disabilities presented by each case.

The first and most essential requirement was the formation of a good relationship with the child. Many came to the clinic, nervous, sullen, anxious, or aggressive as a result of previous mishandling: they had already in many cases developed feelings of

hostility to, or fear of, the adult in authority, and this initial emotional block had to be removed before further treatment could be undertaken with any hope of success. Time was needed -- but was never felt to have been wasted -- in order to build up a feeling of trust between the child and therapist, but once this had been achieved, and satisfactory rapport established, subsequent treatment became much easier.

As the majority of these cases were of at least average intelligence, reassurance about mental capacity was usually possible after the first intelligence test. All the children with the reading disability required the assurance that they were not "stupid", "M.D." or "dumb" -- terms to which most had become accustomed -- and a simple explanation of the meaning and results of the tests was easy and as a rule rewarding. Most of the children with speech defects also needed this reassurance, as most had met with difficulties in school, arising out of their speech defects. Further explanations -- of the simplest character -- were given of the importance of unimanual skills, and in the older children, of the occurrence of crossed hand and eye dominance, after the completion of the various tests of handedness and eyedness.

This initial method of treatment was used in all cases, whether the complaint was of reading or speech difficulty or of undue clumsiness. Thereafter the

child's confidence was steadily built up by helping him to achieve something, however small, and by praising each small achievement generously. For example, many of the children who said they "could not read" were shown that they could, in fact, read a few words or letters (this was almost invariably the case), or were tested with a small sum in arithmetic well within their capacity, and the result was praised; the child with a stammer was shown that he could whisper or sing without stammering; the child with defective speech was shown how, with care, he could utter the critical sounds correctly, and so on -- and the necessity for practice in all cases was gently and repeatedly emphasized.

Most children in the group of selected cases were given some training to increase the dominance of the master hand: the only one who did not receive this training was case XX, who was the oldest boy in the series, with a slight disability, and who had made a satisfactory adjustment. All the others, whatever their special disabilities, received some training; the amount required varied, and was decided upon in each individual case after the tests for dominance had been given; in all the cases where dominance was doubtful, the right hand was trained, while persistent sinistrals had training of the left hand. Hammering, tapping, drawing and the use of various unimanual tools, or games such as tiddlywinks were used, but after some experiment, it

was found that the best results were obtained from the use of the Richardson[49] writing patterns in various ways.

These patterns use the basic forms found in writing (and scribbling), and can be combined to form many attractive designs, but the underlying principle is of free rhythmic movement across the page: this has proved very useful in helping to fix the correct direction of eye-gaze in all these cases and has the additional merit of being very suitable for use in the nursery school. (See Diagrams, p.231)

During treatment, attention was constantly directed to the maintenance of interest, and the multiplicity of designs that could be made and combined and painted in various ways by the children, was found very useful in this respect. The use of these flowing rhythmic patterns appeared to be beneficial in the treatment of <u>all</u> the anomalies, although the reason for this was not altogether clear. It may be held that it was simply the practice of a manual skill that produced the improvement: this may be true in motor awkwardness and agraphia; it is less obvious in the specific reading disability, and does not cover the improvement noted in the speech cases. Something more than mere practice appears necessary for full explanation.

Bearing in mind the work of Eustis[23] (1947) and Langworthy (1933[38] - 1939[39]), can one not assume that the increased use of one hand (consistently in the

left-to-right direction) increases the rate of neuromuscular maturation, and myelination of the special motor and association tracts of the dominant hand and therefore of the appropriate cerebral hemisphere -- or is it simply that the control of the one cerebral hemisphere is called into play more consistently and frequently by the practice of the one hand and it therefore becomes functionally stronger and more dominant, this increased dominance having a beneficial effect on all the various other anomalies? Whatever the underlying reason, the method seems to get good results. (In this context, efforts have been made to allow for the effect of suggestion due to the enthusiasm of the therapists; as far as possible, an objective outlook has been maintained, and the children do most of the painting and writing without immediate and close supervision, as in free play therapy).

The use of the writing patterns places emphasis on one hand, with the development of unimanual skill, and, as noted above, affects all the anomalies: (a) in ambilaterality, <u>one</u> hand receives training; (b) in reading disability, the stress on left-to-right direction is of great importance in fixing eye-gaze by practice, and by kinaesthetic associations; (c) in motor awkwardness (and in agraphia, which is also associated with (b) above), the results come from the practice of a motor skill, which also consists largely in the blending of units into sequences;

(d) in speech defects the explanation is less obvious but is possibly due either to the easy-flowing, rhythmic meuromuscular activities -- associated again with blending into sequences -- being carried over to the controlling speech mechanism at the highest level, or more simply, by the release of tension.

Orton discusses the factors used by the child in learning and points out that some learn mainly visually, others through auditive memories and associations, while others, less numerous, depend more on kinaesthetic factors (e.g. case V in series). The commonest is the visual type, and nowadays our educational system seems biassed in favour of the visual learner -- and this appears to be even more marked in America; nevertheless a large proporation of children are auditive types, and the use of oral teaching and wireless is of great benefit to them; the smallest number of children are those who depend mainly on kinaesthetic factors (feeling through their muscles) in their learning methods.

The general principle, therefore in the treatment of each anomaly, was to reinforce the more defective factor by the other two less affected ones, where possible: for example, the children with specific reading disability (visual) were trained by oral and phonetic (auditory) and writing and tracing (kinaesthetic) methods; and those with speech defects were trained to watch the therapists' lips, and by

attention to reading and the "feel" of the speech muscles in action, were helped by the visual and kinaesthetic factors.

Throughout the treatment of the child as a person, close contact was maintained with his social environment by the psychiatric social worker. The attitudes of the parents often required considerable adjustment and the aim was to obtain a more "accepting" attitude with the use of praise and encouragement instead of criticism and blame, at home. Schools were also visited in order to coordinate their work as far as possible with the methods of treatment used at the clinic; some schools were very helpful, but others were less so: all that could be obtained in some instances was the substitution of neglect for punishment, while the clinic carried out any treatment without assistance.

At the same time as this general therapy was proceeding, each anomaly was receiving more particular and "localised" treatment. (1) In the Specific Reading Disability, there was at first concentration on fixing the correct eye-gaze-direction or orientation, by means of blackboard writing and pointing, and the use of the Richardson patterns, in the left-to-right direction. Then individual letters were learnt by the combined method of "look, trace and sound (or say)". Large letters were used, and their shapes traced out with the finger every time the letters were sounded. When sufficient letters had been

learnt, practice was given in phonetic blending, usually blending the initial letter with the rest of the word -- "C - AT". The methods used conformed very closely to those advised by Schonell and described above (p.214).

There was not much drill at first with phonetic lists, but adequate phonetic repetitions were incorporated in the books read -- the books most frequently used were the Happy Venture Readers (Oliver & Boyd) and the Beacon Readers (Ginn & Co.), with preference for the first mentioned. For older children, the Escalator Booklets (Oliver & Boyd) were found very valuable, but in most cases these children helped to make their own books round subjects of special interest to themselves (aeroplanes, Red Indians and the Adventures of Dick Barton!).

Writing was practised in conjunction with reading, and new words learnt were always written and spelt out orally, in this way reinforcing and combining the visual with auditory and kinaesthetic associations. Spelling was also taught, and selected word lists (as arranged by Schonell) were used for the older children.

Those children whose speech was poor (but not bad enough to warrant special speech therapy) were greatly helped by the use of Rodney Bennett's Play Ways in Speech Training (University of London Press) -- the easy verses were memorised, the speech was corrected, and in addition the memory reading and the use of

reading clues, as advised by Schonell, could be brought into play.

This remedial coaching was essentially individual, but after a short period of purely individual teaching, it was modified usually, so that one half-hour was given up to intensive individual work, while the other half-hour could be devoted to writing, speech training or other activity methods for two to four (the maximum) similar children in a small group.
(2) In the treatment of speech defects, the initial building up of confidence is of primary importance, and, in fact, most of the treatment used by the speech therapist is directed mainly to increasing self-confidence and overcoming feelings of inferiority. For defects of articulation, ranging from minor defects such as lisping, to idioglossia and jargon speech, the child is encouraged to watch the speaker's lips, and the correct sounds are taught and practised. Generous praise is given, and the child is encouraged to demonstrate his achievements to other members of the clinic staff. Here again the Playways in Speech Training[50] have been very helpful.

Stammerers are encouraged to whisper, sing, and to take part in verse speaking (in small groups) in order to demonstrate that the stammer can cease for long periods. This is combined with breathing exercises, and methods of relaxation. More recent experience has suggested that less attention should be paid to the actual speech disability, and more to the relaxation of tension in the various muscle groups,

and the exercising of unimanual skills. Patterns of the Richardson type have been used increasingly of late, but in these cases, the emphasis has been on the painting of large patterns, using the movements of the larger muscles of the shoulder and arm, on easels or large sheets of rough paper. This method of treatment has been thoroughly enjoyed by the patients, interest has been maintained and boredom and resentment reduced to a minimum, with consequent beneficial results.

After a considerable amount of self-confidence had been built up, the use of more active methods of self-expression was attempted. These included charades, small plays, and the use of a variety of puppets. These methods have been very successful in many clinics in England and America, but the "self-contained", undemonstrative native characteristics of the Ulster child (even more marked than in Scottish children) seemed to militate against full participation, and therefore less benefit resulted.

(3) For agraphia and apraxia, the patterns were used again -- and the practice involved in this activity produced excellent results. No child in the series under discussion required to have complete retraining in the use of the other, unaccustomed, hand, but in five cases, showing considerable ambidexterity, extra training was given to the slightly preferred hand to increase the amount of dominance. In these cases preceding practice with the Richardson writing methods, deliberate training on the lines described

by Burt[14] (1937), was carried out for a short time: beginning with large curves, circles and lines on the blackboard using the large muscles of the arm and shoulder girdle, gradually proceeding, as practice produced improvement at each stage, to the use of the wrist, and the finger muscles in small writing with pencil on paper. In case XIII, the clumsiness was very great, and the boy was constantly stumbling or falling and injuring himself, so arrangements were made for him to have in addition a short course of exercises with the physiotherapist, with considerable benefit.

The results of treatment, as shown in Table IV* were generally good. All cases showed some improvement, and most benefited to a considerable extent. Cases I, X, XVII, XX, XXI, and XXII were considered to require no further treatment; and have been discharged as cured or adjusted, although it is intended that each child will be called for reassessment about once a year.

In all cases the improvement in the nervous symptoms and behaviour was marked: in one case (IV, the boy with colour blindness), the mild general anxiety of a secondary nature completely cleared up, but of course the colour blindness was unchanged. In cases I and II, (the cases seen earliest in this series) the Richardson patterns were not used at the beginning of treatment. In case I, this writing method is being used at his present school,

* page 232.

and the general improvement has been marked since he went there. Similarly in case II, the combination of group play therapy with the painting of patterns introduced later, has decreased the tension and produced improvement in the stammer and a very great increase in fluency.

Cases IV and VIII were both dull (I.Q's. of 76 and 79) and it was with some hesitation that they were included in the series. Each had a severe reading disability, out of proportion to his general dullness, and each had a speech defect; it was felt that the difficulties in each case had been increased by the crossed dominance so a period of intensive therapy was tried. The results were good, though it is still questionable whether, in these times of extreme shortage of staff, it is justifiable to devote so much time and attention to these dull and backward children.

Cases VII, XII, XVI, and XXIII all received general psychotherapy, coupled with specialised intensive coaching for their specific reading defect, and in all, there has already been considerable improvement. In case III, no coaching was carried out at the Child Guidance Clinic, but the boy's school, (a small independent public school) was given advice, and the boy himself undertook to continue regular practice on the lines recommended: he has been seen twice in eighteen months, and steady and continued

progress is being maintained.

Cases VI, IX, XIII, and XIX all showed considerable "ambidexterity", or more correctly, ambilaterality, so training was given to increase the unilaterality; all were using the right hand, and on the tests, the right hand appeared slightly dominant except in case XIII, who, however had a dominant right eye, so training of the right hand was continued in all four cases. In addition cases VI, IX, and XIII had extra coaching in reading either at the clinic or at school, on lines recommended by the clinic.

Case XI received speech therapy combined with general psychotherapy: his stammer is still marked, but the accessory movements have entirely ceased, and he is no longer shy, but has made a very satisfactory social adjustment. Case V has received remedial coaching for his reading disability, and general psychotherapy. The general nervous condition has almost entirely cleared up, but the scholastic improvement has been very slow, probably owing to the family attitude of acceptance of the disability as a family characteristic.

Cases XIV and XV both had severe speech defects with marked reading disability, associated with quite severe nervous symptoms: the secondary nervous symptoms have practically disappeared, and the difficulties with speech and reading have shown very great improvement in less than a year. Case XVIII

had also begun to show considerable, all round improvement, but unfortunately her sight has deteriorated, and she is still waiting (for over a year) for new spectacles, and the amount of coaching has had to be drastically reduced -- this unfortunate combination of circumstances has produced a definite set back.

Finally, case XXIV, the pre-school child, received play therapy, and a little speech therapy. There has been very considerable improvement both in speech, which is now perfectly intelligible and fluent, and in behaviour. When in the play group he was encouraged to use his right hand, and after scribbling on the blackboard for some weeks recently, he has now been "promoted" to painting patterns to fix his laterality more firmly, and to confirm the correct eye-gaze-direction before he starts school in the spring.

It is obvious in all these cases, that improvement would have been quicker, and obtained with less effort, had treatment been sought at an earlier date. The advisability of encouraging one handed dexterity before the start of school life cannot be overstressed. This training can be carried out by the parents or in the nursery school: the young child should be encouraged to develop right handed skill -- opportunities for scribbling or painting (on large surfaces like easels or blackboards) should be provided, and after the age of about 4, the child can be introduced to the "game" of making designs or

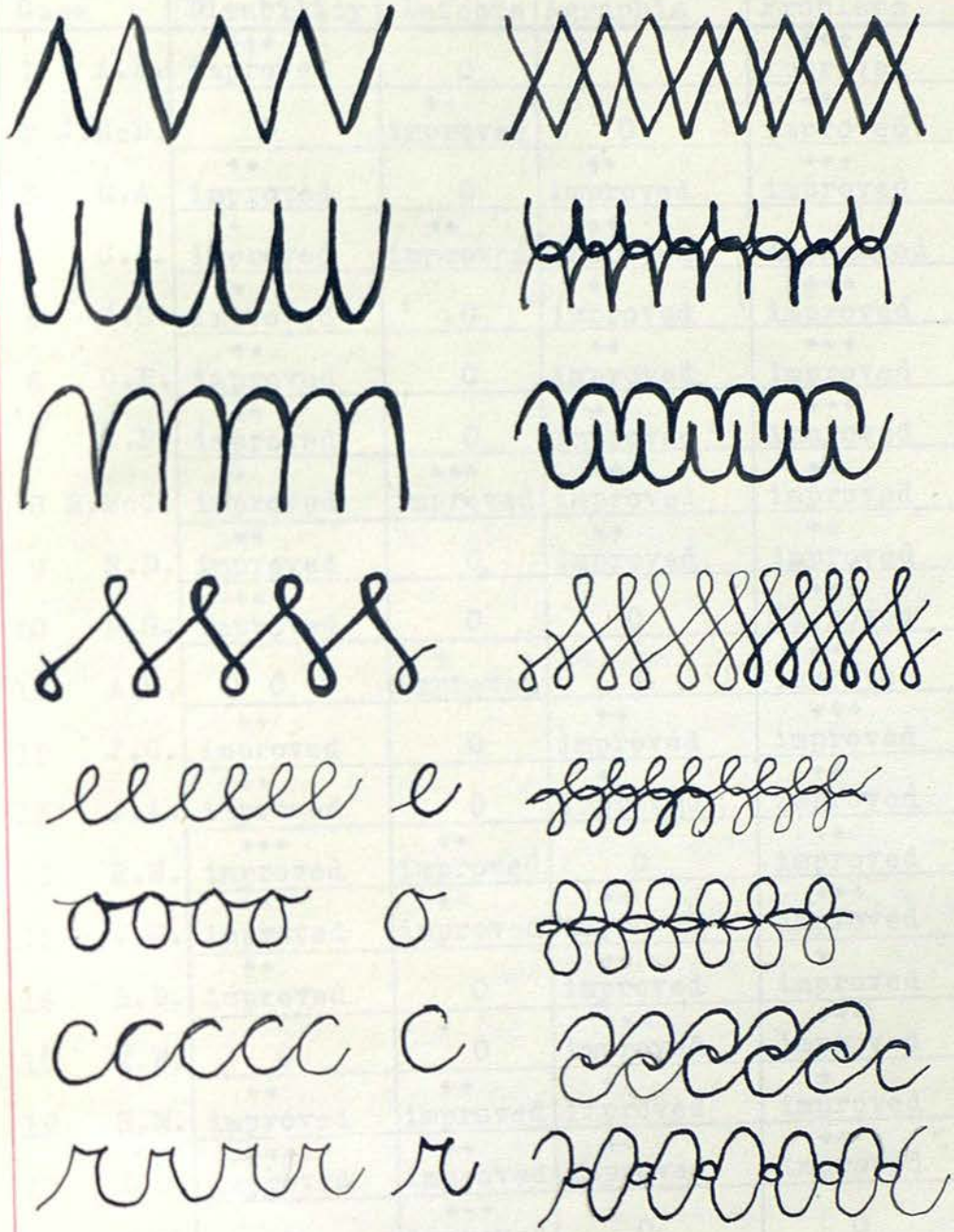
patterns of the more regular Richardson type, and so have training in the left-to-right eye-gaze- direction.

Only where left-handedness seems very strong and persistent, and developing early, should this training of the right hand be abandoned; the child should then receive as much -- or more -- unimanual training as his fellows, but applied to his left, dominant hand. In such cases, the earlier the sequential left-to-right patterns can begin, the better, as the left-handed child will tend to have more difficulty in acquiring the correct eye-gaze-direction and to need more help in so doing.

For all cases showing significant ambilaterality, it is advisable to concentrate on unimanual training. In such cases it has been considered wiser to stop piano lessons (an essentially bilateral activity) until such time as unilateral dominance has been firmly established. It is seldom however that this ban is required in practice, as the disabilities usually occur in boys -- and it is not so common in this country for the boy to have piano lessons, as for his sister!

Marion Richardson Writing Patterns.

To maintain the child's interest, these patterns can be combined and coloured in many different ways.



Basic patterns and letters. Combined patterns.

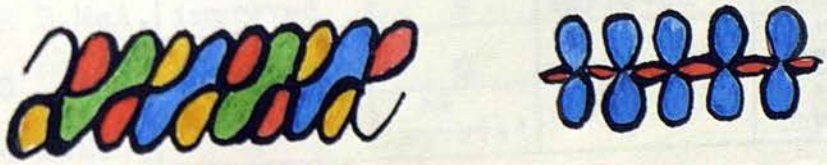


Table IV.

Results of Treatment.

Case	Specific Reading Disability	Speech Defects	Awkwardness including Agraphia	Nervous & Behaviour Problems
1 A.K.	+++ improved	0	0	+++ improved
2 J.McD.	0	++ improved	0	++ improved
3 M.A.	++ improved	0	++ improved	+++ improved
4 C.R.	+ improved	++ improved	++ improved	unchanged
5 G.H.	+ improved	0	++ improved	+++ improved
6 C.P.	++ improved	0	++ improved	+++ improved
7 J.P.	++ improved	0	+ improved	+++ improved
8 R.McC.	+ improved	+++ improved	++ improved	++ improved
9 N.D.	++ improved	0	++ improved	++ improved
10 N.G.	+++ improved	0	0	+++ improved
11 A.E.	0	+ improved	0	+++ improved
12 J.C.	++ improved	0	++ improved	+++ improved
13 J.A.	++ improved	0	+ improved	++ improved
14 R.W.	+++ improved	++ improved	0	++ improved
15 J.H.	++ improved	++ improved	++ improved	+++ improved
16 B.D.	++ improved	0	++ improved	+ improved
17 M.W.	0	0	+++ improved	+++ improved
18 R.M.	++ improved	++ improved	+ improved	+ improved
19 D.C.	+++ improved	++ improved	++ improved	++ improved
20 B.B.	0	+++ improved	0	0
21 B.R.	+++ improved	0	0	+++ improved
22 B.McA.	+++ improved	0	+++ improved	+++ improved
23 A.A.	+++ improved	0	0	+++ improved
24 B.McC.	0	++ improved	0	+++ improved

GENERAL CONCLUSIONS.

The nature of Cerebral Dominance:

The exact nature of cerebral dominance is still in doubt. The opinion of earlier workers appeared to be that dominance of the left cerebral hemisphere was the most important factor for consideration in studies of the developmental anomalies of language. As research produces more facts, however, the problem becomes more and more complex and it is less easy for definite conclusions to be drawn.

There is fairly general agreement on one point, however (Blau being the main dissentient), this point of agreement being that there is a hereditary factor in laterality or one-sidedness, including dominance of one cerebral hemisphere, but that this hereditary factor varies considerably in strength, and the ultimate sidedness has to be fixed by training and practice. After study of Langworthy's work, Eustis suggests that this hereditary factor may have something to do with the rate of myelination. According to Langworthy, myelination is developed in a definite, probably hereditary and phylogenetically determined sequence or pattern, the tracts associated with the highest and most lately acquired functions -- those of language and manual dexterity -- being the last to be myelinated; myelination continues to increase in these higher association areas and tracts, the rate of increase being related to and accelerated by function, until adolescence,

or maturity at about twenty. The higher association areas of the cerebral hemisphere are amongst the latest to become myelinated and it would seem logical to assume, if the findings of Langworthy are accepted, that the last to be myelinated will be those association tracts passing from the dominant to the non-dominant hemisphere, that is to say, those associations concerned with the highest form of unilateral control.

It is still however by no means certain whether dominance of one hemisphere is primary in development, or whether it is secondary to the extra functional use of the preferred hand. This extra use increases the rate of myelination of that side, and therefore the association tracts of the opposite cerebral hemisphere become more completely myelinated, and that hemisphere therefore presents a higher level of maturation, which enables it to take over control of the hemisphere with the lesser degree of maturation. It must be remembered, however, that the non-dominant hand is not merely a passive and inactive member; it cooperates continually with the dominant hand, and is used for holding, steadying and stabilising activities, which usually call into play different sets of muscles from those being used by the dominant hand. These co-operative activities must equally increase the rate of myelination by functional stimulation, so that on balance, it does not seem that the functional use of one preferred hand

can be the sole and primary explanation of cerebral dominance. Nevertheless, Blau is of the opinion that dominance of the hand is built up first by practice, and that dominance of the opposite cerebral hemisphere follows as the direct result.

Orton considers, on the other hand, that there is an inherent superiority of one cerebral hemisphere over the other, the nature of which has not so far been detected, but which, he suggests, may be ultramicroscopic, or chemical, or electrochemical. As a consequence of this superiority in structure or complexity, the association areas or "centres" for the language functions and the highest motor skills, are developed in that, the more highly organised, hemisphere. Brain believes that the "speech nodes" are located first, and that handedness follows this localisation, but he agrees with Orton that the superiority of the cerebral hemisphere itself is the factor of importance, and adds that dominance or superiority of the left cerebral hemisphere appears to be inherited as a modified Mendelian dominant, while dominance of the right cerebral hemisphere is transmitted as a Mendelian recessive character.

Perhaps Eustis' theory, based on Langworthy's researches in physiology and embryology, presents the most workable hypothesis, in that it is capable of application to handedness and the language anomalies alike, and in addition to the question of cerebral dominance itself. The close parallel already noted

between the anomalies and stages in the development of the normal infant, is most suggestive, and it has already been pointed out (p 40) how mere delay in the process of neuromuscular maturation may produce the various anomalies. This theory can also be connected up with the proposition of Anderson and Weigall, that the language disorders and anomalies of dominance are indications of a defective integration of the central nervous system, if by defective integration one assumes that the highest level of integration (and/or neuromuscular maturation) has not been reached. Eustis observes also that there are familial or hereditary differences in the rate of meuromuscular maturation, while the close correlation between myelination and maturation receives further confirmation from Flechsig's[51] observation that myelination occurs earlier in females, coupled with McCarthy's[52] findings that speech also begins earlier in girls.

One is therefore tempted to accept the hypothesis that the language disorders and the associated anomalies of handedness are related to a slow or delayed maturation process, which is in turn the result of a slow rate of myelination of the higher association tracts in the cerebral hemispheres. As a direct result of the delay in myelination of the highest and most lately developed association tracts and areas (those relating to unilateral dominance for language and manual skills) certain immature neuro-

muscular patterns will continue in existence until the subject is older, and if assistance is not given by various training methods, will become fixed by habit.

It is therefore very necessary that these cases should be diagnosed early so that adequate training can be instituted to prevent the fixation of these immature patterns as bad habits of reading, speech, or motor activity. These immature patterns theoretically should correct themselves in time, that is to say, neuromuscular maturation will eventually be completed, but only provided there is no blocking by secondary emotional symptoms or by difficulties arising in education. It is almost certain that most of the milder forms of these anomalies do, in fact, clear up spontaneously, but the more severe forms become fixed if untreated.

One agrees also with the opinions of Orton, Burt and Eustis, that a hereditary factor plays a considerable part in the production of this syndrome. This probably involves transmission of the superiority of left cerebral hemisphere and right hand as a dominant Mendelian character, while dominance of the right cerebral hemisphere and left hand is a Mendelian recessive which is sex linked to a considerable extent.

Owing to the complexity of the factors involved in dominance and handedness, and the fact that in man it is unusual to have mating of pure homozygous

stocks, the inheritance will show less regularity and many more variations than are found in controlled laboratory breeding experiments with rats or flies. In addition, the strength of the inherited trait varies within wide limits, and may be fixed or completely altered by training -- this fact is also a source of difficulty in deciding how much weight should be given to the hereditary factor.

It is to be noted, also , that handedness can usually be retrained if necessary, without much trouble or difficulty, if the retraining is undertaken early, preferably before the end of the child's first school year, at the latest. This is true for the vast majority of cases, only the few very persistent sinistrals resisting this retraining. It is usual, in addition, when the dominant hemisphere has been damaged by injury or disease early in life-before the age of 5 or 6 -- for the non-dominant hemisphere to take over the language functions -- with complete success.

Cerebral dominance, it may be concluded, consists in the building up of a completely maturated neuromuscular association system, with the controlling area situated in one hemisphere only. This dominant hemisphere is usually the left, and located in it are the areas controlling language and the most highly developed motor skills. The lower and more primitive forms of these activities are bilateral, but for the highest, most matured and most highly

integrated form, essentially unilateral cerebral control is required. It has been assumed that the association areas for language and dexterity are situated in the one, dominant, hemisphere. Nevertheless, more recent work suggests that this is not always true: emotional and expletive speech is always possible from the minor side, after the major side has been damaged, and it now seems likely that there is a primitive form of speech, more emotional than propositional, which does not require unilateral control, and which is comparable to, and probably contemporaneous with, the earlier ambilaterality of handedness -- (Nielsen 1941).[53]

In many children, unilateral dominance is incomplete: by complete unilateral dominance, one means right hand, right eye and right foot dominance with dominance of the left cerebral hemisphere; those cases with left hand, eye, and foot dominance and right hemisphere dominance, also show complete unilateral dominance, but this latter combination is less satisfactory in our present culture, which is definitely oriented in favour of right handedness. Different variations of crossed dominance are found, where the master hand and the master eye are on opposite sides, this implying that the left hemisphere is not in complete unilateral control; and similarly, the many cases showing ambilaterality of ~~the~~ hand or eye -- or both -- also imply that unilateral cerebral control is not completely

established.

When this incomplete unilateral control exists, the various anomalies of language may be found, and these can all be explained by the hypothesis of delayed neuromuscular maturation --or delayed myelination. In the specific reading disability, the significant factor involved seems to be the preferred direction of eye-gaze. If this varies sometimes between from left-to-right, and from right-to-left, confusion in orientation and blending of sequences is bound to arise. All young children glance both ways at first, but preferred eye-gaze-direction soon develops, and as one handed skill develops, the eye will tend to follow -- or watch-- the hand, and in right-handed, right-eyed persons the preferred eye-gaze is confirmed in the left-to-right direction.

In the left-handed, however, the hand tends to move out from the centre, from right-to-left, and the eye-gaze tends to follow this direction too, probably (a) to avoid the line of vision being blocked, to some extent, by the bridge of the nose, and (b) to prevent the work being obscured by the working hand. As the child gets older neuromuscular maturation continues and the eye-gaze-direction becomes more consistent and fixed by practice in the correct direction. If maturation is slow, the eye-gaze direction will be slow to become fixed and consistent, and the continued reversed glances will

produce brief reversed memory images which form the basis of the disability.

Stammering also is believed (in this type of case) to be due to the fact of both hemispheres being active, but without the complete "supervisory" unilateral control, the development of which has been delayed; both hemispheres act, but the actions lack proper synchronisation, this synchronisation being a function of the controlling, dominant, hemisphere.

This lack of synchronisation has been more or less confirmed by Lindsley (1940)[54] who found that in electroencephalograms of normal speakers, the alpha waves were smooth and synchronous, while in stammerers the waves in the tracings from the two hemispheres were frequently out of phase, and often obliterated.

Finally, motor speech delay, defective articulation and motor awkwardness, with their marked resemblance to infantile patterns, seem obviously to be due to delay in neuromuscular maturation.

These conclusions are only tentative, but they at least provide a provisional hypothesis on which methods of treatment or training can be based. It is however essential while this immediate treatment proceeds, on a partly experimental basis, that the problem as a whole should continue to be studied. Further long-term research is required into several aspects of the problem:-

(1) on the physiological level, into the later progress of myelination and its relationship to

neuromuscular maturation;

(2) further study of the electrical activity of the brain as shown by electroencephalography: investigations on the lines of Lindsley's work, might be made into any electrical confirmation of hand or hemisphere dominance, or whether the reversals of eye-gaze, so common in cases with reading disability can be correlated with any significant differences in the tracings of the two hemispheres. Unfortunately, at present there is an insufficiency of equipment and of trained staff, and therefore such an investigation cannot be carried out for some time;

(3) a survey of the amount of crossed or incomplete dominance remaining in a section (preferably an intelligent section) of the adult population, with investigation of the presence of any of the anomalies in the personal or family history;

(4) finally, another line of research which might provide interesting results for purposes of comparison, would investigate the prevalence of the specific reading disability in readers who are accustomed to the Semitic languages with their right-to-left orientation, and whether there is a higher proportion of left-handedness amongst the Semitic races. Burt (1937)[14] has already noted that Jewish boys in London are less commonly affected by the specific reading disability than English boys -- he notes also that they suffer much less commonly from hypermetropia and strabismus. These boys are of course mainly

European Jews who read both European language (left-to-right) and Hebrew (right-to-left), and therefore the development of correct eye-gaze habits will have to be consciously acquired and consciously adapted to each language. A comparison of Burt's results in London Jews, with the results of an investigation into the reading habits of a Semitic race whose reading material is confined to Semitic sources, should also prove interesting.

Ascertainment.

(A). Prevalence (of the problem):

Before consideration of the prevalence of the problem, it must be remembered that the cases which have been discussed, form a small group of children, each with one or more of the anomalies described, and presenting some degree of incomplete cerebral dominance.

It is not proposed to include cases with a low level of intelligence, when considering the wider aspects of ascertainment and treatment, as it is unprofitable in many ways to devote time and money to the special coaching of dull and backward children. It is probably advisable to include no child whose I.Q. is below 90. There is no doubt that all the anomalies are present to a much greater degree in the more backward children, than in those with average intelligence -- this could be explained by the slow and defective development and the greater relative neuromuscular immaturity of such defective

children. When moreover, surveys are taken of the incidence of left-handedness, or speech defect, in the whole population, the results are weighted by the much greater frequency of these anomalies in the backward and defective.

It must be remembered also that the large group of backward readers contains only a small number with the specific reading disability described in this paper; the others may have defective vision, defective hearing, defective powers of visual and auditory discrimination, or poor memory and concentration due to emotional factors. Similarly, all children with speech defects cannot be included in this group; stammering is frequently caused by emotional factors alone: delay in speech, or defective articulation are very often entirely due to maternal mis-handling -- but may also be due to organic causes such as the various forms of deafness, including high-tone deafness.

Agraphia and motor awkwardness may be a result of minor degrees of cerebral palsy, etc. In addition, all the anomalies are commonly found in children attending special schools but in these cases they are associated with a defective intelligence as well. The children in the group under discussion, show some of the anomalies, in association with varied forms of incomplete dominance, but most have average, or above the average intelligence.

It is not easy to obtain figures to show the

prevalence of this syndrome, as those authorities who have given figures have usually been studying one anomaly in particular. Burt (1937)[44] has noted that about 1% of London school children (in ordinary schools) stammered but the percentage rose to above 5% when he included other speech defects, and also all cases who had a history of previous stammering.

Eustis[16] believes that one child in ten has the specific reading disability, and that one in twenty will be unable to learn to read unless he receives special assistance. These proportions appear to be higher than those usually found in this country; in America, however, reading is taught almost universally by the sight, or "flash-card" method, which, it has been noted above, is very apt to aggravate the difficulty; in Britain, the teaching is by means of the combined phonetic method to a very large extent, which is more suitable for these cases, and more are therefore able to profit from ordinary school teaching.

The figures for left-handedness given by various authorities may range fron 1% to 30%, although the more usual range is from 3% to 20%, the larger figure including young children and mental defectives. Probably the more correct proportion amongst normally intelligent school children is between 5% and 10%, with a higher percentage for boys, and a lower percentage for girls. Left-eyedness is found in greater proportions, in from 25 % to 30% of the population.

From the study of all these figures, it seems

probable that the basic syndrome of incomplete cerebral dominance is present in from 20% to 25% of the normally intelligent in the population; and that this produces varying degrees of disability, some slight, and spontaneously clearing up, and others severe and requiring skilled treatment over a long period of time. It is believed that in Britain the proportion of the normally intelligent requiring treatment is between 3% and 5%.

(B). Methods now in use:

In America, where, for some years, the problem has been studied more systematically than in this country, there are more definite plans for ascertainment of the children presenting this syndrome. The larger foundations in the main cities there, have frequently special departments or clinics for the study of "language problems" attached to their pediatric or child guidance services: for example, the Language Clinic at the Massachusetts General Hospital, Boston, and the Language Research Unit at the Iowa State Psychopathic Hospital. It is to be noted that these are Language Clinics, and not merely centres for speech therapy as is the usual arrangement in Great Britain.

In Britain, too, the problem is being tackled, especially in the larger centres of population, where wider facilities such as child guidance clinics, or educational psychologists' departments, are more easily found. In London and Edinburgh, for instance, there are planned schemes for testing and assessing

the progress of children at regular intervals, from the infant school upwards, and these special children who show marked disparity between their mental age and reading age, are soon sifted out for further specialised investigation.

The milder cases, in which the disability is not severe (a reading age showing retardation of not more than 1½ to 2 years) are allocated to suitable small classes for special tuition where this is needed. The severer cases of the disability are referred to a child guidance clinic for further study of the "whole child", and arrangements are made for a period of special individual treatment (where this is required), followed by tuition in a special group, until the child is ready to return to his correct class.

Children with defects of speech are also investigated by the school authorities, and eventually the comparatively small number exhibiting this syndrome to any marked degree, reach a clinic where they can receive unified treatmeht for all their anomalies. Defective speech is, of course, more obvious than the specific reading disability, and speech cases are therefore sent for treatment earlier, as a rule, but increasing interest in the problem of the specific reading disability which is so often found in association with the speech defects, is resulting in diagnosis of all these special cases at a much earlier stage.

In Bootle, to take an example of an urban area, with a smaller population, the Medical Officer of Health has circularised all schools, drawing attention to the problem, and advising "care and sympathetic treatment in the School, of these children who are having difficulty in their work because of crossed laterality". He emphasizes in this bulletin to teachers, that the essence of prevention is to recognise the condition when the child is learning to read, and to give skilled tuition then, remembering always that such a child, however intelligent, will be slower to learn the use of the written symbol, but that he will, with care, and if necessary, with special tuition, eventually master it, (Swan 1949).[55]

In the West Riding of Yorkshire, a mainly rural area, an attempt is being made by the Educational Psychologist to find out how many apparently bright children there are, who are not doing so well at school as might be expected. Head teachers are being asked to send in reports on such children, who are then to be examined by the educational psychologist, to sift out those with the specific reading disability. As this area is large, and the County Council is responsible for many small and scattered units, the psychologist has suggested that a special boarding school should be set up for these intelligent children with the reading disability. The teaching methods in this school should be very flexible, and in essentials, fitted to the require-

ments of each child individually; it is also suggested that other exceptionally bright children in the area, who do not fit in well in the ordinary schools, might well be educated there too (Armstrong 1949)[56].

There is, of course, great variation up and down the country, in the way in which cases are diagnosed: in many places the very existence of the problem is ignored. There is still a noticeable tendency, moreover, to select the cases with speech defects, and send them to a speech therapist (often at a "school speech centre"), and to send all the backward readers to the educational psychologist, and thence to a "class for backward readers". It is frequently not until the case is reviewed by the psychiatrist, that unified treatment of the whole individual is instituted.

In Northern Ireland, the problem has hardly been touched -- it has been swamped in the large amount of work that has had to be faced as a direct result of post-war legislation. Here, until 1948, there was no Mental Deficiency Act, as in Great Britain, and no proper method of dealing with mentally defective children, apart from one small and very inadequate special (day) school in Belfast. There was little attempt made to classify children -- for where could they be sent if they were mentally deficient? -- and other backward children, including cases like those under discussion, were only too often considered "M.D.".

and, in the ordinary schools, were left to drift at the back of the class until they reached school leaving age -- unless they attracted attention by bad behaviour. In some schools however it was noticed that these children were often good at arithmetic and other non-verbal subjects, so their failure in reading and writing was ascribed to stupidity, laziness, or inattention, with only too often, undeserved, and repeated corporal punishment as a result.

In 1944, the Belfast Child Guidance Clinic was properly constituted, with a small, but fully trained staff, and since then, by the use of various propaganda methods, there has been a very slow, but steady improvement in ascertainment. At the beginning of 1949, the third part of the 1948 Mental Treatment Act came into force, making provision for the ascertainment and treatment of mental defectives -- "children in need of special care, who by reason of arrested or incomplete development of mind are socially inefficient"..

Slowly but surely, these defective children are being ascertained, and in the course of this ascertainment, children who are scholastically very backward, but have average, or above the average intelligence, are being found, and referred to the Child Guidance Clinic: the majority of such children have been found to have one of the developmental language disorders -- while several others have been found to have high-tone deafness.

Later in 1949, the City of Belfast, for the first time, appointed an Educational Psychologist, and a Speech Therapist, and this problem is now receiving more adequate attention. In the rural areas of Northern Ireland, however, the existence of the syndrome has hardly yet been recognised. During the last four years, only three cases of the specific reading disability have come to the Clinic from areas outside Belfast: one (case III) was brought by his father who noticed his educational backwardness; case VII was referred to hospital for defective vision; and case IX was referred to the clinic for delinquency, which was thought to be due to mental deficiency.

Within the last year however, two counties have appointed speech therapists, and with their co-operation, and that of the County Medical Officers of Health, interest in and awareness of the problem is slowly spreading to the more distant areas.

Up to the present, the handling of these children in the schools has shown lack of understanding and has often been unsympathetic and harsh. Admittedly the classes are almost invariably too large, but the constant use of ridicule, sarcasm, and indiscriminate corporal punishment to which many of the children have been subjected, has produced a crop of severe secondary symptoms of an emotional character which have greatly increased the difficulty, and consequently the duration and cost of treatment.

From one school, which has an exceptionally good reputation in all other ways, two small boys came, a short time ago, who had had their knuckles caned regularly for (a) persisting in trying to write with their left hands, and (b) for untidy, messy writing and bad spelling mistakes when they used their right hands.

Until recently, little could be done for this group of children, except to treat the few isolated cases who were diagnosed after referral to the clinic, usually on account of secondary symptoms, or "deficiency". In most of these cases, however, the problem was directly discussed with the child's headmaster and class teacher, and as a result, in these few schools, attention has been drawn to the problem, and the majority of these teachers, in spite of their overwork, and over-large classes, are showing interest and sympathy, and co-operating closely with the clinic.

Reports have also been sent out to the school medical authorities, and they are steadily disseminating information throughout the counties. This is still a very circumscribed process, however, and is in practice mainly confined to the discussion of individual cases. Information about the syndrome has also been spread in the course of propaganda lectures given by members of the clinic staff to various audiences, such as parent-teacher associations, teachers' groups and medical and teaching students.

(C). Plans for the future:

In the future, the earliest possible diagnosis of these cases should be planned for, so that adequate treatment may be instituted at the earliest possible moment. It is considered advisable that a start should be made in the training colleges for nursery -- and infant -- school teachers who should be trained to recognise signs which indicate the possible development of the various anomalies, for example, slow and defective speech , ambilaterality, sinistrality, and scribbling and drawings showing consistently reversed orientation. They should also be instructed in the cautious use of methods of training these children to use the right hand, and warned of the need of seeking skilled advice should the training methods fail, before secondary symptoms present added difficulties.

For better ascertainment, once the child has reached the ordinary infant school, it is advisable for all children to be tested towards the end of the first year. Each school, or group of small schools, should have one teacher who is trained in the administration of tests: intelligence tests of the group picture type (e.g. the Moray House tests) and attainment tests like those of Burt or Schonell. These group tests should be considered as part of the ordinary school work, and should not be given too much importance or spoken of as "intelligence tests" in front of the children. The tests should

not take up much extra time, but the information from this extra effort is of the greatest value in the selection of children with different problems, and in particular, those with the specific disabilities; they will also give considerable assistance in the grading of children for higher or lower divisions of classes, in the ordinary routine of school work.

All children who show unusual or abnormal results in these group tests, or discrepancies between intelligence and attainment, should be referred to the school psychologist or a child guidance clinic for a further and more detailed individual examination, using the full batteries of tests, as described in earlier sections of this thesis. In particular, tests of vision, hearing, visual and auditory discrimination, and directional attack on words should be given. Later in school life -- at about 8 years -- a second series of tests should be given; these will pick out the children who have been unable to keep up with their age-group, and who are therefore steadily failing, and beginning to acquire secondary inferiority feelings.

The children ascertained at the first test, should respond rapidly to modifications in the methods of teaching, and at most, will require tuition by special methods for a short time, in small groups of carefully selected children. They should quickly become able to take their places again in the ordinary classes. The older children however, will almost certainly

have developed fixed unfavourable habits, and also secondary emotional symptoms, and these will require more active and prolonged treatment, by means of individual psychotherapy and intensive, specialised coaching.

With adequate testing at these two age levels ($5\frac{1}{2}$+ and 8+) most children with the specific reading disability will be found, and adequate therapeutic methods can be thereupon instituted. Still older children, whose disability has continued undiagnosed for years, will have to be sought for individually, and it must be remembered that the original disability will probably be concealed by a number of secondary symptoms. To find such cases attention must be constantly directed to the possibility of their existence, by means of propaganda lectures to teachers and parents, and by visits to schools; the diagnosis of one such case in a school, followed by a visit from the psychologist or psychiatric social worker, has always been of great assistance in drawing attention to the possible existence of other, similar cases.

To obtain better ascertainment, the syndrome might also be described in one of the bulletins that are issued by most education authorities for the circulation of information to individual schools. This has already been done in Bootle, as described above. It is important, when writing or lecturing about this problem, to give adequate information about the treatment of the minor anomalies, and also

about the facilities and methods available for the treatment of severer forms. It is a common experience to find low ascertainment figures, when facilities for treatment are lacking: for example, this has been noted in many areas, with reference to the ascertainment of mental defectives -- and as soon as accommodation is provided, the rate of ascertainment has risen.

It is probable that the setting up of a "Language Clinic", as such (incorporating the speech therapy department, of course), would focus more attention on the syndrome as a whole, and more cases would almost certainly be referred for diagnosis and treatment. Where no Language Clinic exists, it is essential that the closest liaison be maintanied between speech therapists and psychiatrists and psychologists so that cases sent in the first instance for speech therapy may be thoroughly investigated for the presence of other anomalies related to disturbances of cerebral dominance.

Treatment: now and in the future.

The detailed treatment of the various anomalies associated with incomplete cerebral dominance has already been fully discussed in earlier sections of this thesis, and only the broad principles underlying this detailed and individual treatment will be repeated now.

On the assumption that functional use and practice will increase the rate of myelination and neuro-muscular maturation, the use of training methods which will increase unimanual dexterity, and in consequence the functional superiority of the associated cerebral hemisphere, is recommended. Directional training to fix the preferred eye-gaze-direction and to increase the skill of the preferred hand, are instituted, preferably before school age and the beginning of reading. In addition, the principle of reinforcing the defective factor in the learning process by emphasis on the other factors is recognised: for example, the reinforcement of the defective visual factor by auditory and kinaesthetic factors in the specific reading disability.

The earlier the syndrome is recognised, the easier and more rapid is the treatment, and every effort should be made to avoid the full development of any of the disabilities and still more, of secondary symptoms arising therefrom. To this end, much more attention must be given to the pre-school child -- and to his mother who must undertake his early training.

Those who work in Child Welfare Clinics (dealing with pre-school children), should have some understanding of the problem, and be able to give the enquiring mother advice about training in handedness. An observant worker in a Child Welfare Clinic can note those children who tend to use their left hands,

and can advise the mother to try and train the child to use the right, but without any pressure or forcing. Similarly children who are obviously clumsy and awkward must be encouraged and helped by practice to do more for themselves and thus increase their dexterity: and motor speech delay, and early speech defects can be detected early and advised upon.

In the nursery school, also, adequate care can be taken to prevent many of the disabilities becoming severe, if early notice is taken, and skilled professional advice sought at this stage. In the nusery school, the child is encouraged to draw or scribble with chalk on a blackboard, or to paint on an easel; the teacher should try to arrange that the chalk or brush is always held in the right hand, and should note the presence of any persistent sinistrals.

The family doctor, also has opportunities of knowing those families with significant histories of the various anomalies. He is therefore in an excellent position to advise parents -- and to watch for the earliest signs of these anomalies and deal with them promptly.

The foregoing suggestions, however, demand that the various observers, whether welfare workers, teachers, or doctors, should have some knowledge of the problem, and it is therefore essential that they should all have had some psychological training. This is very slowly being achieved, but even today,

there are too many Medical Schools which do not offer even a voluntary course in medical psychology to their students. In the meantime, it is hoped that by lectures to these interested bodies -- doctors and nurses engaged in Child Welfare work, and the others mentioned before -- that more attention can be directed to prevention in the pre-school years.

The provision of more nursery schools would undoubtedly further this aim, as the trained staff maintain close contact with the mothers and can easily advise on the day-to-day training of the child in all matters, including handedness. In the later years at the nursery school, those with speech defects which have failed to improve after social contact with other children, can be referred to the Medical Officer for further investigation and treatment. In the last year, practice in pattern painting (of the Richardson type), will help to fix the correct eye-gaze-direction and to increase manual dexterity and the child's "readiness for writing" so that he is well prepared to receive systematic teaching, and for the learning of reading, when he reaches the primary school.

In Northern Ireland, general educational methods still require to be recast, and modernised. As yet, owing to extreme shortages of accommodation and trained teachers, the infant classes are greatly overcrowded, and there is simply no room for the more modern "activity" methods of teaching. There should

be a far greater use made of these activity methods, not only in the teaching of reading, but in the use of speech -- with free descriptions and discussions of matters of interest chosen by the children; the use of speech-training and verse speaking: and the encouragement of dramatic expression in charades, and plays. Such activities increase the vocabulary and ease of self-expression, and in themselves are of great assistance in the treatment of minor degrees of speech defect.

When it is suspected from the family history, and from previous observation, that any child has a tendency to develop one of the disabilities, it is often advisable that a considerable amount of practice should be given with writing patterns, before the teaching of reading is begun, and that later, reading and writing should be taught together, concurrently, so that each word read can also be written. A flowing, "joined," and cursive script, from the beginning, is considered to be more suitable for such children, than the printing of separate capitals, with which the teaching of writing so often begins.

Once a disability <u>has</u> developed fully, the child must be referred to a suitable clinic for treatment without delay. A period of individual training, every school day, may be required for several months until the child shows considerable improvement. Later, the treatment may be given to small groups of similarly affected children, and finally, cases with

the reading difficulty, may receive further training in the schools from teachers who have had training in and experience of these special remedial methods. As improvement continues, the child can return to ordinary school life, with only occasional checks and brief periods of revision of the essential points in the treatment. The therapy of speech, of reading and of motor awkwardness, are combined throughout with active psychotherapy, to provide a comprehensive treatment of the child as a whole.

Recently there has been a tendency in some schools to adopt "modern" methods for the teaching of reading, by which are meant the flash-card or sight methods used mainly in America. It is considered that this entirely visual method should be discouraged, as there seems to be little doubt that the use of this sight method is productive of proportionately more cases of specific reading disability in America, than result from the combined word-whole and phonetic method in use in this country. The use of a few "look-and-say" words, combined with a larger proportion of the phonetic method, is working successfully in this country, especially when used in conjunction with varied activities, as advised by Schonell. This method also is the only method which is successful with children who have the specific reading disability.

It is therefore obvious, that for prevention of the disabilities arising out of the syndrome of incomplete dominance, the early indications and signs

must be known, and carefully observed. It follows that those who deal with young children must have some training to enable them to recognise these warning signs. Eventually it is hoped that all medical students will receive adequate training in medical psychology (including child psychology) and that doctors who specialise in Child Welfare, Pediatrics, or the School Medical Service, may have further education in these special aspects. Until then, the problem must continue to be brought to the notice of the school authorities in every possible way, by means of lectures, articles in the professional journals (medical and educational), and by personal contacts and discussions.

Prognosis: It has been emphasized throughout this thesis, that little trouble need arise from anomalies of cerebral dominance and their effect on the various functions of language, provided that there is awareness of the problem, and that early diagnosis and immediate treatment are obtainable.
Anomalies of cerebral dominance alone need not, in themselves, produce unfavourable symptoms. The anomalies are shown by incomplete dominance of one hand, or by crossed dominance of hand and eye, and can be entirely without symptoms or stress, if educational methods are not such as produce unnecessary strain, and included under this head are methods of discipline as well as methods of teaching.

Except in the very few persistent sinistrals,

training or retraining in the use of the right hand need produce no symptoms, if it is carried out gradually and sympathetically, preferably before the child reaches the age of six. If the methods used are forcible and harsh, or if they are attempted when the child is older, the prognosis is much less favourable, and it is in such cases that a stammer, or secondary emotional symptoms are likely to arise.

Complete and persistent sinistrals should not be retrained, but instead, taught to make a proper adjustment to their left-handedness, and to accept it as entirely natural, and at times -- as in certain games -- even advantageous. In these cases, the child has usually no emotional or other symptoms and the prognosis is uniformly excellent.

Very severe degrees of the specific reading disability, originally described as "congenital word blindness" by Hinshelwood, are fortunately very rare, and when these are diagnosed at the beginning of school life, treatment is usually, in the end, completely successful, although such treatment, involving as it does, very prolonged and individual tuition in reading, combined with oral instruction in all other school subjects, is lengthy and expensive. Milder degrees of reading disability are, as a rule, easily treated by modifications in the teaching methods in early school life. When, however, the disability has been missed, and the child has continued in an unfavourable atmosphere, dropping

further and further behind till his reading age shows more than two years retardation, it is then that severe secondary symptoms occur, and the treatment becomes lengthy and slow. Even in these cases, the ultimate prognosis is good, provided satisfactory rapport can be established early, and sufficient time and attention can be given to the individual child. It is, however, often most disheartening for both child and therapist, if the condition -- so essentially curable in the early years -- is not discovered until the age of 12 or later.

Speech defects also respond well to treatment, provided, again, that they are tackled early, before emotional symptoms are superadded. This applies particularly to those cases with speech defects associated with anomalies of cerebral dominance, but is of course applicable to speech defects, whatever the aetiology, arising in children of normal intelligence. When the child has once developed anxieties about his defect, then treatment becomes much more difficult, the emotional strains in themselves aggravate and confirm the unstable speech patterns, and the end result is likely to be less uniformly good.

The prognosis in developmental awkwardness is good, again with the proviso that no inferiority feelings are allowed to develop. These children should receive constant encouragement, and be shown that by practice, adequate performance can be

achieved -- and even a performance that is above the average -- if the practice is consistant and not vitiated by boredom. One example of this is shown in case XIII, where an exceedingly clumsy, awkward, and accident-prone, little boy succeeded in achieving a high degree of skill in one activity only -- fishing with rod and line; another case is quoted by Eustis, of an airman who succeeded in overcoming all his motor awkwardness during the war, and became an excellent flier, with obviously very good neuromuscular co-ordination, although he remained very clumsy and awkward in all his activities on the ground.

In general, treatment undertaken early gives excellent results, and the prognosis is therefore very good. If left till later, treatment can still produce good results provided enough time and attention can be given to the individual child.

The higher the level of intelligence, the better are the results of treatment and the more quickly are they produced -- modified by the observation that these very intelligent children are naturally more likely to suffer from feelings of inferiority and resentment about their disability. The prognosis in children with lower intelligence than the average, is less good, and with the present insufficiency of accommodation and trained personnel, it is not considered altogether justifiable to undertake prolonged individual remedial training of such children.

Nevertheless, the prognosis, even in those children whose I.Q. is between 80 and 90, is reasonably good, when training methods such as those recommended for the nursery school, and the early months in the infant school, are used at the first sign of any anomaly.

In conclusion, it may be said that the prognosis is excellent when the syndrome is diagnosed and treated early -- preferably in the pre-school period. It becomes less favourable the longer the disability has existed without treatment, and is not good in children of lower intelligence.

SUMMARY.

1. The Nature of the Problem: Cerebral dominance and its relationship to the problems of handedness and disorders of the language function are discussed in detail, with comparisons of the theories put forward by different authorities.

It is noted that Man alone has developed symbolic language and unimanual skill, and that this is associated with control by one cerebral hemisphere. In the majority of people, the dominance is of right hand and left cerebral hemisphere, but there is still some divergence of opinion whether dominance of hemisphere, choice of master hand, or location of "speech nodes", is the primary factor.

Majority opinion is that there is a superiority of the left cerebral hemisphere, which may be structural, or electro-chemical, in nature, and which may be a dominant Mendelian trait, while dominance of the right cerebral hemisphere resembles a Mendelian recessive character, which is sex-associated to a considerable extent. The hereditary factor may be strong or weak, and the weaker can be strengthened or altered by training.

There is a wide range of laterality, shown by dominance of hand, of eye, and of foot, and these may all be on the same side, or may show crossed dominance of hand and eye (foot dominance being of little practical importance). There are variations in degree of each form, and hand or eye may be strongly dominant,

or there may be ambidexterity, or,more correctly, ambilaterality.

The presence of crossed dominance of hand and eye, or of incomplete dominance of either or both, indicates that dominance of one cerebral hemisphere is not completely established. This incomplete cerebral dominance is significantly associated with disorders of the language function, and with undue clumsiness. There is a small group of cases of a specific type, presenting anomalies of dominance associated with language disabilities and developmental apraxia, and with a significant family history as a rule. This syndrome is essentially developmental in origin, and not due to disease or injury.

The different disabilities found are: specific reading disability (or congenital word blindness, or developmental alexia), which also includes disability in spelling; developmental word deafness (or congenital auditory imperception) which is very rare and which, with modern methods of diagnosis, is often found to be due to a selective deafness, such as high-tone deafness; speech defects, which include motor speech delay (delayed onset of speech and defects of articulation) and stammering; developmental agraphia (partly due to specific reading disability, partly to apraxia); and developmental motor awkwardness (or apraxia). Each anomaly can occur in varying degrees of severity, and each can be combined with others; a significant family history (of one or more of these

disorders, or of anomalies of handedness) can almost invariably be found.

Various theories of aetiology are discussed and related to the development of each anomaly; most weight is given to Eustis' theory, partly confirmed by embryological and physiological research, that the whole syndrome depends on a slow rate, probably genetically determined, of myelination, and neuromuscular maturation. The application of the hypothesis to each anomaly is demonstrated and also the explanation it provides for the success of the methods employed in treatment.

Basically, the anomalies are seen to arise from confused orientation, leading to defective recognition and recall of sequences, and incorrect fusion or blending of units to form these sequences. The units described are visual, in reading; auditory or phonic, in speech; and simple units of muscular movement in motor activity.

It is estimated that the syndrome of incomplete cerebral dominance is present in from 20 to 25% of the population (of normal intelligence) and that 3-5% will present anomalies severe enough to require skilled treatment. It is noted, however, that all backward readers, and all stutterers do not exhibit this syndrome, or belong to this specific group.

2. How it can be tackled: The essential requirement is early diagnosis and treatment of the syndrome, and emphasis is given throughout to the importance of

early ascertainment. Long-standing cases require lengthy individual treatment, and therefore those in contact with the pre-school child must have training to enable them to recognise early signs, and to give advice at the outset.

Long-term plans envisage better psychological education of medical students, and those in training colleges for teachers, combined with the use of more flexible methods in the schools. Methods of approach to doctors, teachers, and child welfare workers are advised for use now.

It is recommended that attempts should be made to train all children to use the right hand, but if such training requires undue stress, the child should be allowed to continue to use the left hand. This training should be completed in the pre-school period.

The specific reading disability must be diagnosed early, and teaching methods must be modified to suit each case -- this implies an early test of intelligence and attainments. Speech defects must also be treated early and in both these disabilities, the development of secondary symptoms must be avoided and handling must be sympathetic throughout.

The child who has developed any of the disorders must be treated as an individual; psychotherapy of the whole child must be combined with specific treatment of each anomaly present, and with environmental adjustment where necessary. In the more detailed discussion of the treatment, the principle of rein-

forcing the defective factor by the other two main factors involved in learning, is emphasized; for example, the defective visual factor in the specific reading disability is reinforced by the less affected auditory and kinaesthetic factors. It is noted that treatment is less easy, therefore, when disabilities involve more than one of these factors.

The use of patterns -- painting or writing patterns -- has produced good results in all the anomalies, these results being due to the fixing of eye-gaze-direction in the reading disability; to smooth rhythmic movements and relaxation of tension in speech defects; and to mere unimanual practice in developmental apraxia and agraphia -- and possibly in all cases, to the effect of these painting and writing patterns as a form of expressive therapy.

Continuation of the present methods of teaching reading (activity methods, with a combination of "look-and-say" word-wholes with phonetics) is advised, as the use of the purely "sight" method appears to increase the amount of reading disability.

3. Results to be expected: It is stressed throughout that the prognosis is good, provided that treatment is undertaken early. If cases with the specific reading disability are ascertained at the very beginning, the results of treatment are uniformly good, and as a rule, no permanent disability remains.

Successful results are also to be expected from treatment of all the associated speech defects, if

undertaken early, before the development of inferiority feelings. Similarly, any child can overcome the disability of undue motor awkwardness, with encouragement to practise.

Those cases which have not been diagnosed till later are much more difficult to treat, but with adequate time and individual attention, even these respond satisfactorily. It is, however, not considered justifiable to devote the amount of time required for individual coaching to those children whose intelligence (which must be carefully tested, and allowance made for the influence of their disabilities on the results) is below normal.

By adequate training in the pre-school years, many of these anomalies can be prevented. Most children can be trained to dominant right-handedness and the correct fixation of eye-gaze-direction, before reading is begun.

Persistent sinistrals (those resisting retraining), if taught to adjust properly to their left-handedness, become normal and valuable members of the community.

With careful observation and training in the pre-school period, and early ascertainment and treatment of the anomalies at the first sign of any difficulty, the end result should be a perfect adjustment.

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